EPA Region 5 Records Ctr.
216883

MIDCO CONCEPTUAL WORK PLAN
ALTERNATE REMEDY

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October 2002

CONTENTS

CONTENTS
(continued)

TABLES

FIGURES

APPENDICIES

MIDCO CONCEPTUAL WORK PLAN
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EXECUTIVE SUMMARY

The Midco I and II sites (the "Sites") are two related but non-contiguous sites undergoing remedial activities. Operations at the Midco I site were conducted on an approximately 4-acre parcel at 7400 West 15th Avenue, Gary, Indiana from 1973 through 1979. Operations at the Midco II site were conducted on approximately 7 acres at 5900 Industrial Highway, Gary, Indiana, from 1976 through 1978. Operations at the Sites included storage, processing and disposal of industrial waste. Under a 1985 Consent Decree a Remedial Investigation/Feasibility Study (RI/FS) was completed at each site between 1985 and 1989. The RI at each site showed that the shallow ground water and portions of the subsurface soils were impacted with Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), metals, and cyanide. However the ground water movement is slow and the contamination had not migrated far from the Sites.

In 1989 the United States Environmental Protection Agency (USEPA) approved a Record of Decision (ROD) for each site that selected the remedial actions to be undertaken. The RODs specified onsite treatment of impacted subsurface soils utilizing a combination of solidification/stabilization (S/S) and soil vapor extraction (SVE), excavation and treatment of impacted sediments from wetlands surrounding the Sites, construction and operation of a ground water pump and treat system at each site, construction and operation of a deep underground injection well for disposal of treated water, and construction of a final cover along with access restrictions and deed restrictions. In an April 1992 Amendment to each ROD, USEPA revised the RODs to include a provision that S/S must be conducted by an *in situ* method, delineated minimum areas for treatment (MATs), specified soil sampling procedures, defined soil treatment action levels (STALs), and established wetlands restoration requirements, as well as other minor additions and clarifications. The 1992 ROD Amendments provided that SVE could be conducted either with the *in situ* S/S or as a separate operation.

After exhaustive treatability testing, the USEPA determined that a binder could not be found that met the requirements established in the Consent Decree and Statement of Work (SOW) for treatment of the contaminants at the site using S/S. Because of the failure to find an acceptable binder for S/S as well as the inherent difficulties in performing S/S at sites containing large amounts of debris, the USEPA and the Midco Remedial Corporation (MRC) decided to examine alternative remedial actions.

In a December 1997 draft Explanation of Significant Differences (ESD), the US EPA proposed using Synthetic Precipitation Leaching Procedure (SPLP) testing to define the soil that required remediation. As such, the soil remediation would be based on impact to the ground water, given that the cover and access and deed restrictions would address the risks from direct contact with the soils.

In the spring of 1998, the MRC collected soil samples at the Sites that were analyzed using the SPLP test and delineated areas of soil contamination. The grid soil sampling at the Sites demonstrated that the soil contamination was not primarily in the minimum areas of treatment (MATs) as believed when the 1992 ROD Amendments were issued. It also demonstrated (along with the 2002 Midco II test pits) that there were large volumes of broken concrete, buried metallic objects, cables, etc. that would make an *in situ* S/S operation technically infeasible.

This document outlines an alternate remedial action that replaces S/S with *in situ* SVE, containment and air sparging (AS). We believe this remedial action approach is more protective, more technically effective and provides greater efficiency than S/S. The alternate remedy proposed here incorporates the existing ground water pump and treat system and SVE discussed in the ROD and will meet the primary remedial objectives of the ROD. As this approach uses most of the elements of the original ROD remedy, as amended in 1992 administratively it can be accomplished with an ESD, rather than a ROD amendment. Access and deed restrictions, wetland restoration requirements, ground water monitoring, ground water pump and treat, and sediment excavation and containment have already been implemented at the Sites.

Along with those activities previously completed, the alternate remedy includes the following components at Midco I:

- Eliminate the principal threat at the site by constructing a containment/barrier wall around the Midco I exclusion zone (i.e., the area inside the final fence defined in the SOW) to permanently contain the source area.
- Use the existing ground water pump and treat system to dewater inside the containment area to a depth of 12 ft below grade.
- Mass removal of VOC contaminants through the use of *in situ* SVE followed by bioventing in the shallow soils of the Midco I exclusion zone.
- Cover the exclusion zone with a low-permeability asphalt cap to reduce infiltration and prevent direct contact with COCs while allowing future productive use of the site.
- Continue the existing pump and treat operation outside the exclusion zone for a period of approximately one year after installation of the containment/barrier wall, and then use natural attenuation and a ground water use restriction for any remaining ground water impact.

Along with those activities previously completed, the alternate remedy includes the following components at Midco II:

- Mass removal of VOCs through the use of *in situ* SVE in the most heavily impacted shallow soils of the exclusion zone.
- Mass removal of ground water VOCs through the use of AS wells in the most impacted areas of Midco II.
- At a minimum, cover the area being treated with a low permeability soil cap to reduce infiltration and prevent direct contact with contaminants while allowing future productive use of the site.
- Continue the existing pump and treat operation inside the exclusion zone as necessary until the use of natural attenuation and a ground water use restriction can be demonstrated as protective for any remaining ground water impact.

This proposed alternate remedy is composed of robust remedial treatments that are capable of meeting the primary objectives of the RODs at the Sites and will more than adequately address the principal threats at the Sites. This remedy completely contains the source area at Midco I and directly treats substantially more soil than the 20,000 cubic yards previously proposed by the ROD Remedy. Specifically, the alternate remedy is:

- Protective of public health and the community as well as of workers during implementation,
- Protective of the environment,
- Technically feasible and available,
- Administratively feasible, and

Furthermore, these activities will result in site conditions that correspond with the anticipated use of the Sites following remediation.

1.0 INTRODUCTION

This Conceptual Work Plan presents proposed modifications to the requirements of the ROD Amendments for soil treatment and methodology for the Midco I and Midco II Sites that will be pursued to achieve final closure of the Sites while allowing redevelopment and consistent with site conditions. Furthermore, this document presents alternatives for resolution of all remaining issues at the sites. The proposed changes modify some of the components of the Remedial Action approved for the Midco I and Midco II Sites in the June 1989 ROD and the 1992 ROD Amendments. The modifications proposed here may require an Explanation of Significant Differences (ESD), but will not require an amendment to the ROD.

The 1989 ROD provides for treatment of soil that exceeds the risk-based action level by SVE for the VOCs, and S/S for the SVOCs and metals. The 1992 ROD Amendments provided specific minimum performance standards (MPSs) for the SVE and S/S treatment, and defined minimum soil treatment areas and Soil Treatment Action Levels (STALs) for areas outside the minimum treatment areas and soil sampling procedures. The 1992 ROD Amendments also delineated MATs where SVE and S/S were required without further soil sampling. These areas were based on RI sampling results that indicated the MATs exceeded the STALs. However, the amendments defined additional sampling and risk-based calculation procedures to be used to determine compliance with the STALs. The risk calculation procedure considered residential exposure to the soils from ingestion, direct contact and inhalation using the Total Waste Analysis results of the grid samples.

The 1998 SPLP soil sampling at the Sites, performed in response to the USEPA proposed December 1997 ESD, indicated that the MATs did not represent the principal threat at the Sites. A relative risk evaluation procedure prepared by Roy F. Weston Inc. on behalf of the USEPA and submitted to the MRC on May 19, 1999 was used in this plan to help define the areas of principal threat.

The Alternate Remedy presented in this document takes into consideration the risks from the grid soil sampling performed in the spring of 1998 and the findings of the test pit sampling conducted at the Midco II Site in March 2002. The proposed remedy for

Midco I includes the use of a containment/barrier wall, capping and dewatering for the Midco I Site Exclusion Zone, allowing for SVE of the majority of the soil within the exclusion zone. The proposed remedy for the Midco II Site soils includes localized SVE and AS.

1.1 Site Locations and Surrounding Area

The Midco I Site is located in a mixed area of commercial and industrial use along with limited residential areas and is within the Gary/Chicago Airport Development Zone. The Midco II Site is situated in a predominantly industrial area and within the proposed expansion of the Gary/Chicago Airport Development Zone. The nearest residences are situated about 900 feet south of the Midco I Site and one mile southeast of the Midco II Site. The Midco I Site is located at 7400 West Fifteenth Avenue in the southwest quarter of the northwest quarter of Section 11, Township 36 North, Range 9 West, in the southwestern portion of Gary, Indiana, Figure 1. The property is bordered on the west and southwest by an Indiana Department of Transportation (INDOT) facility; on the east by a privately owned parcel currently leased to Roadway Express; on the south by an auto parts distributor; and on the north by several small, privately owned undeveloped parcels of land, Figure 2. Wetlands and construction debris are present in the vacant parcels surrounding the site to the north and east.

The Midco II Site is located at 5900 Industrial Highway (U.S. Route 12) in the northwest quarter of Section 36, Township 37 North, Range 9 West, in the western portion of Gary, Indiana, Figure 1. The site is bounded on the north/northwest by an auto salvage yard; on the east/northeast by an unused CSX Corporation (CSX) railroad right-of-way; on the south/southeast by vacant land owned by the Gary/Chicago Airport Development Zone; and on the west/southwest by Industrial Highway and on the north/northwest by the Avenue Towing and Storage facility, Figure 3. The Midco II Site is located within the Gary/Chicago Airport Development Zone Expansion Area.

1.2 Site Background

1.2.1 Midco I Site Background

Industrial waste recycling, storage, and disposal at the Midco I Site began sometime prior to June 1973. A variety of industrial wastes, including unknown quantities of bulk liquid industrial wastes, were disposed of at the site. Waste storage and disposal operations included: (1) storage in four bulk tanks with capacities ranging from 4,000 to 10,000 gallons; (2) open storage and stockpiling of 55-gallon drums; and (3) disposal of wastes into on-site pits, including industrial sludges and residues in a large.

The Midco I owners were notified of violations of the State's permit procedures during several site investigations conducted by the Indiana State Board of Health (ISBH) between 1973 and 1976. In December 1976, a fire at Midco I burned an estimated 14,000 drums of chemical waste. After the fire, the Midco I owners moved the facility operations to the Midco II Site, and leased the Midco I Site to Industrial Tectonics, Inc. (INTEC). INTEC renewed active operations at the Midco I Site in October 1977.

Fire-damaged drums of waste were still at the Midco I Site in 1978. During an inspection in March 1979, the ISBH found that INTEC had accumulated several thousand drums of waste. The State and the USEPA collected samples of soil, waste, and ponded water from the site in April and May of 1979. The USEPA constructed a fence around the Midco I Site in June 1981 and retained Ecology and Environment, Inc. (E&E) to conduct a preliminary hydrogeological study of the site between June 1981 and September 1982.

In January 1982, the USEPA announced a contract award for the removal of hazardous wastes from the Midco I Site. A clay cap, ranging in depth from 0 to 1 foot, was placed over the area of the site to the west of Blaine Street. The removal action activities were completed between February 1982 and July 1982. The site was placed on the National Priorities List (NPL) in September 1983. Under a 1985 Consent Decree, the Potentially Responsible Parties (PRPs) conducted a Remedial Investigation/Feasibility Study (RI/FS) at the site from 1985 to 1989 under the lead

of the USEPA and the Indiana Department of Environmental Management (IDEM) as the support agency.

The ROD was issued in 1989, and a consent decree to implement the remedy was signed by the PRPs and the USEPA and IDEM in July 1992. At that time, the PRPs formed the MRC to manage the implementation of the remedy. Access and deed restrictions were established between 1992 and 1993, and the wetlands restoration requirements were met in 1993. In early 1993, a Pre-design Investigation was conducted to determine the area of ground water recovery, and in the summer of 1993 contaminated sediments were consolidated on-site. A deep injection well was advanced in a nearby Indiana Department of Transportation (INDOT) maintenance yard in 1993; and from 1994 through 1996, a ground water extraction and treatment system (GWETS) was designed and constructed. The GWETS started operation in January 1997.

Soil samples collected from the Midco I Site were tested by Kiber Environmental for USEPA between 1994 and 1996 to determine appropriate S/S mixes to use in the field. The bench-scale treatability testing results indicated that none of the S/S mixes tested produced a stabilized soil that would meet all of the MPSs specified in the SOW. Based on the results of the treatability testing, USEPA proposed a modification of the MPSs in a draft ESD dated December 1997, to use SPLP soil concentrations for a specific sub-set of 29 parameters (including VOCs, SVOCs polychlorinated biphenyls (PCBs) and metals) to define the areas requiring treatment.

The MRC collected soil samples in the spring of 1998 and analyzed them for the sub-set of SPLP parameters. The results provided an indication of the potential sources of ground water impact at the sites and demonstrated that most of the impact was due to VOCs. A bench scale test of chemical oxidation performed in 2001 indicated that chemical oxidation could remove the toluene, ethyl benzene, xylenes and chlorinated volatile ethenes (such as tetrachloroethene and trichloroethene) from the Midco I soils, but no significant removal of methylene

chloride[1] was observed under the conditions evaluated. In addition, the quantities of oxidant that would be required are at least one order of magnitude and up to two orders of magnitude higher than typical amounts. As a result, implementation of chemical oxidation would be extremely expensive at the Midco I Site and would not adequately address the risk and was not considered further.

In March 2002, a limited ground water investigation was performed to evaluate the presence of free cyanide in monitoring wells that contained total cyanide in 2001 above the clean-up levels (CALs). The results indicated the presence of free cyanide above the CALs in just one of the monitoring wells located in the exclusion zone (see Appendix A).

In April 2002, ground water was sampled outside the exclusions zone in the areas of the P and B well clusters due to indications of ground water impact in these areas noted during the annual sampling. The methods and findings are detailed in Appendix B. The analytical results indicated that the impacted ground water was limited to less than 100 feet downgradient of the P and B well clusters and that the impact was generally near the level of the CALs.

1.2.2 Midco II Site Background

Operations at the Midco II Site were initiated sometime prior to January 1977. Waste handling activities included the temporary storage of bulk liquid and drummed waste and reclaimable materials, the neutralization of acids and caustics, and the on-site disposal of wastes via open dumping. By April 1977, the Midco II facility stored waste oils, oil sludges, chlorinated solvents, paint solvents, paint sludges, acids, and spent cyanide in approximately 12,000 to 15,000 drums, each having a capacity of 55 gallons. In August 1977, a fire burned equipment, buildings, and an estimated 50,000 to 60,000 drums of waste.

The ISBH collected soil and waste samples at the site in June 1977, and the USEPA obtained soil, waste, and ponded water samples from the site in August 1979 and February 1981. The USEPA constructed a fence around the Midco II Site

[1] The only organic compound that is present in the ground water at Midco I at levels that require treatment prior to injection in the deep wells.

in August 1981 and retained E&E to conduct a preliminary hydrogeological study of the site between 1981 and 1983. During the emergency removal activities conducted by the USEPA between February 1984 and 1989, over 500 drums of waste, soil contaminated with PCBs from a sludge pit, and soil contaminated with cyanide from a filter bed were removed from the site. The Midco II Site was placed on the NPL in June 1986. Under a 1985 Consent Decree, the PRPs conducted a Remedial Investigation/Feasibility Study at the site from 1987 to 1989 under the lead of the USEPA with IDEM as the support agency. The ROD was issued in 1989 and a consent decree to implement the remedy was signed by the PRPs[2] and the USEPA and IDEM in 1992. The MRC is also managing the implementation of the Midco II remedy. Access and deed restrictions were established between 1992 and 1993 and the wetlands restoration requirements were met in 1993.

In early 1993, a Pre-design Investigation was conducted to determine the area of ground water recovery and in the summer of 1993 impacted sediments were consolidated on-site to the extent practicable. From 1994 through early 1995, a GWETS was designed and constructed, including installation of a pipeline to transport the treated effluent to the deep injection well in the INDOT yard, near the Midco I Site. The GWETS started operation in January 1996.

Soil samples were also collected from the Midco II Site and were tested by Kiber Environmental, for USEPA, between 1994 and 1996 to determine appropriate S/S mixes to use in the field. The bench-scale treatability testing results indicated that none of the S/S mixes tested produced a stabilized soil that would meet all of the MPSs specified in the SOW. Based on the results of the treatability testing, USEPA proposed a modification of the MPS in a December 1997 draft ESD to use SPLP concentrations to define the areas of Midco II requiring treatment.

The MRC collected soil samples in the spring of 1998 and analyzed them for the subset of SPLP parameters. The results provided an indication of the potential sources of ground water impact at the site and demonstrated that most of the impact was due to VOCs and that the PCBs were unlikely to migrate to the ground water. As previously mentioned, bench scale testing of chemical oxidation

[2] Most of the PRPs for the Midco I site are also PRPs for the Midco II site.

indicated that, although this technology showed promise in the treatment of toluene, ethyl benzene, xylenes and chlorinated volatile ethenes (such as tetrachloroethene and trichloroethene) in the Midco II soils, no significant removal of methylene chloride[3] was observed under the conditions evaluated. In addition, the quantities of oxidant that would be required are at least one order of magnitude and up to two orders of magnitude higher than typical amounts. As a result, implementation of chemical oxidation would be extremely expensive at the Midco II Site and would not adequately address risk at the Site, and was not considered further.

In February 2002, several test pits were excavated in the area of the filter bed at Midco II. Samples of soil and ground water were collected, and indicated the presence of elevated VOCs. However, no light nonaqueous phase liquids (LNAPL), as previously reported during monitoring well sampling, were found. Appendix C describes the procedures and results.

A March 2002 additional ground water investigation, described in Appendix A, indicated that free cyanide was present above the ground water CALs in one of the two monitoring wells where total cyanide had been detected above the CALs in 2001.

1.3 Chemicals of Concern

Chemicals of concern (COCs) at the Sites have been defined and progressively refined based on the samples collected during the following events:

- The 1985/1986 RI sampling;
- The 1993 pre-design ground water investigation;
- Six annual ground water monitoring events (1996 to 2001), consisting of obtaining samples from 40 and 38 monitoring wells at the Midco I and Midco II Sites, respectively, augmented with two and three piezometers at the Midco I and Midco II Sites, respectively, since 2000;

[3] Methylene chloride at elevated concentrations was detected in the SPLP leachate of several of the soil samples collected at the Midco II site.

- The soil samples collected for treatability testing of S/S and chemical oxidation;
- Six soil gas sampling events;
- The 1998 SPLP soil sampling event, when a total of 161 and 334 investigative soil samples were collected at the Midco I and Midco II Sites, respectively;
- Approximately 18 or 24 quarterly treatment system influent sampling at the Midco I and Midco II Sites, respectively;
- The 2000 extraction well sampling;
- The 2002 geoprobe investigation of the Midco I area of organics outside the exclusion zone (described in Appendix B);
- The 2002 additional ground water investigation of selected Midco I and Midco II monitoring wells (described in Appendix A); and
- The 2002 test pit sampling at Midco II (described in Appendix C).

Approved revisions to the frequency of analyses during the annual ground water monitoring events, including analyzing only for VOCs, Target Analyte List inorganics, sulfide, and hexavalent chromium at specific times, began with the 1998 sampling event.

1.3.1 Midco I COCs

Because the Alternate Remedy at the Midco I Site is to contain the COCs by surrounding the exclusion zone with a containment/barrier wall, the COCs were evaluated based on their presence on- or off-site, the "Site" being the area within the final fence defined in the SOW. Most of the on-site COCs are found in the shallow portion of the aquifer, with only a few compounds detected sporadically above but near their respective CALs in the deeper portion of the aquifer. The COCs in the ground water, based on the 2001 annual ground water monitoring event for the VOCs and inorganics, the 1997 annual ground water monitoring event for the rest of the organics, the 2002 additional ground water sampling, the 2002 geoprobe sampling and the SPLP sampling are as follows:

On-Site Ground Water:

- The VOCs of most concern are methylene chloride, trichloroethene, tetrachloroethene, vinyl chloride, benzene, toluene, ethyl benzene, total xylenes, acetone, 2-butanone or methyl ethyl ketone (MEK), and 4-methyl-2-pentanone or methyl isobutyl ketone (MIBK). Other VOCs that have been detected at levels close to their respective CALs include chloroform; cis-1,2-dichloroethene; and 1,2-dichloropropane;
- Other organics detected sporadically on site slightly above their respective ground water CALs include pentachlorophenol at MW-4S and C-10, dieldrin at MW-2S and MW-5D, endrin at MW-5D, and heptachlor epoxide at MW-2S; and
- Of the inorganics, cyanide (a portion as free cyanide and a portion as complexed cyanide), antimony, arsenic, barium, total chromium, copper, manganese, nickel, mercury, thallium, and vanadium have been detected above the CALs.

Off-Site Ground Water:

- Four VOCs were detected at levels less than an order of magnitude greater than the CAL (benzene at P-10) or close to the CALs (methylene chloride and chloroform at B-30, and trichloroethene at P-10). Monitoring wells P-10 and B-30 are near the final fence;
- Other organics detected sporadically above the CALs in the off-site monitoring wells include polynuclear aromatic hydrocarbons (PAHs) at MW-11S, L-10, and L-30. These three wells are near areas where significant debris dumping and filling operations have been taking place by others for at least six years; and
- Inorganics detected above the CALs include cyanide (all present as complexed cyanide), arsenic, antimony, barium, total chromium, manganese, nickel, thallium, and vanadium, most of them concentrated in two wells near the edge of the capture zone (G-10, G-30, and H-30) and one well closer to the Site (B-10).

In addition, the ground water samples from the Calumet Aquifer beneath, west, north, and northeast of the Midco I Site contained high concentrations of sodium and chloride, with total dissolved solids (TDS) detected at levels of up to 35,500 mg/l. During the RI, the INDOT facility, which is located west of the Midco I Site, was identified as one of the sources of the salt and some of the cyanide in the ground water.

1.3.2 Midco II COCs

The COCs detected in ground water samples from the monitoring well network, the extraction wells, and the 2002 test pits are listed below. On-site monitoring wells included in the evaluation are those inside the final fence established in the SOW.

The COCs inside the Midco II Site final fence are detected in both the shallow and deeper portions of the aquifer, with the VOCs more prevalent in the shallower portion of the aquifer, with the exception of (1) the ketones, which are also found in the deeper wells at elevated levels; and (2) benzene, methylene chloride, and vinyl chloride, which are found at isolated deep monitoring wells at levels above but close to the respective CALs.

On-Site Ground Water:

- The VOCs of most concern include vinyl chloride; trichloroethene; tetrachloroethene; 1,2-dichloropropane; cis-1,2-dichloroethene; 1,1,1-trichloroethane; benzene; toluene; ethyl benzene; xylenes; acetone; MEK; and MIBK. Other VOCs detected at levels close to their respective CALs include 1,2-dichlorobenzene; 1,1-dichloroethene; 1,2-dichloroethane; 1,1,2-trichloroethane; and methylene chloride;
- SVOCs detected above the CALs include PAHs (C-10, D-10, E-10, H-10, and/or R-10), pentachlorophenol (F-30), isophorone (R-10 and R-50), and PCBs (C-10 and D-10); and
- Inorganics present above the CALs inside the final fence include cyanide (a portion as free cyanide and a portion as complexed cyanide), arsenic, barium,

total chromium, manganese, nickel, and thallium. Arsenic and barium are widespread in the deeper portion of the Calumet aquifer within the Site;

Off-Site Ground Water:

- VOCs detected above the CALs in the off-site wells include benzene (S-10 and T-10) at levels near its CAL; and MEK, acetone, total xylenes, and ethyl benzene at T-50. These two wells are located adjacent to the final fence on the northeastern site direction;
- Other organics detected sporadically above the CALs in the off-site monitoring wells include PAHs at P-10, T-10, and U-10; pentachlorophenol at MW-3S; and dieldrin at V-10;
- Inorganics detected above the CALs, mostly in the deeper portion of the aquifer, include arsenic, barium, total chromium, and nickel. Inorganics detected above the CALs in only one or two wells include selenium and vanadium at S-10; thallium and manganese at U-10; and hexavalent chromium at S-50 and V-50. Selenium, vanadium, and hexavalent chromium were not detected above their respective CALs inside the final fence in 2001, but have been detected at similar (hexavalent chromium) or much lower levels (selenium and vanadium) in at least one monitoring well inside the final fence.

The ground water samples collected from the Calumet Aquifer contained aluminum, potassium, sodium, and chloride at high concentrations in comparison to the background concentrations, as well as TDS values of up to 86,500 mg/l. During the RI, the aluminum-rich fill material found at the site was identified as the major source of the salt components.

2.0 CONCEPTUAL REMEDIAL WORK PLAN

2.1 ROD Remedy

The ROD Remedy promulgated in 1992 and described in the Consent Decree SOW included the following:

- Site security and access restrictions - (completed),
- Close out of previous investigations - (completed),
- Excavation and on-site storage of contaminated sediments and soils - (completed),
- Ground water extraction and treatment to meet CALs – (underway),
- Deep well injection of treated ground water– (underway),
- Ground water monitoring during operation of treatment system– (underway),
- Soil treatment by SVE or S/S (after treatability study),
- Final site cover after soil treatment,
- Final access restrictions,
- Long term monitoring for 15 years following completion of remedial action, and
- Completion of appropriate EPA plans and submittals.

In addition, the PRPs had to provide wetlands restoration funds as indicated in Paragraph 88 of the Consent Decree. The first six listed items of the ROD remedy and the wetlands restoration activities are either completed or underway. As described in Section 1.2, the treatability studies found that neither S/S nor chemical oxidation soil treatment methodologies were the most appropriate and cost effective for the Midco sites. Therefore, soil treatment by SVE and bioventing is proposed as described below.

2.2 Alternate Remedy

The proposed alternate remedy for Midco I and Midco II is described in this Conceptual Work Plan. Details of the components of the alternate remedy are presented in Sections 3 and 4. The goal of the remedy is to remove the majority of the risks

(principal threat) posed by the soils to the ground water and to contain and/or remove the organics from the ground water.

The Midco I Alternate Remedy includes the following:

- Revision of ground water AWQCs,
- Design of the SVE soil treatment system,
- Construction of a containment/barrier wall around the exclusion zone (referred to the following as contained area),
- Spreading of stock-piled impacted sediments in the contained area,
- Partial dewatering of the contained area using the existing extraction wells,
- Installation of SVE system,
- Installation of low permeability asphalt cap over the contained area,
- SVE of soils in contained area aggressively for 12 to 18 months,
- Continued soil treatment using bioventing, and
- Natural attenuation of limited organic-impacted ground water areas outside the contained area.

The Midco II Alternate Remedy includes the following:

- Design SVE and AS systems for soil treatment area,
- Spreading of removed sediments in the soil treatment area,
- Installation of SVE and AS systems,
- Installation of low permeability soil cover over the portion of the site being treated,
- SVE and air sparge the northern area, which includes the old filter bed area, followed by bioventing and biosparging,
- SVE and air sparge limited portions of the southern area, which includes the former road area, followed by bioventing and biosparging,
- Recalculation of clean up criteria with ground water use ordinance,
- Pump and treat ground water as needed to meet revised clean-up criteria,
- Future installation of a cover at the site appropriate for future site use, and

- Natural attenuation of limited inorganic-impacted areas.

The proposed Alternate Remedy includes implementing SVE at the Midco II Site first. Once the Midco II Site's SVE remediation is complete, the vacuum blower and emission control system will be transported from Midco II to Midco I, and the SVE system started at the Midco I Site.

2.3 Alternate AWQC/CALs

In order to more appropriately assess the off-site COCs, an evaluation of the SOW site-specific ambient water quality criteria (AWQC) was performed. The evaluation indicated that the SOW surface water body receptors for the Sites differ from those determined in 1992, and that the current receptor of any COCs after natural attenuation is the Grand Calumet River. A factor of approximately 2000 over the previously calculated AWQC was determined to apply to the discharge of COCs to the Grand Calumet River (see Appendix D). The evaluation of the off-site ground water COCs, described in Sections 1.3.1 and 1.3.2, was performed by using the recalculated AWQCs and corresponding CALs (Appendix D). The proposed revised AWQCs and CALs are presented in Table 2-1.

2.4 Proposed Remediation Areas

The 1999 evaluation of the soil SPLP data prepared by Weston on behalf of the USEPA indicated that 84.6 % of the potential risks posed by leaching of the soil contaminants to the ground water were produced by the VOCs of concern and 2.8 % were produced by the SVOCs of concern. Weston's evaluation was based on two major conservative assumptions: (1) that the soils would leach under natural conditions at the levels found in the SPLP test, and (2) that the ground water was used as a drinking water source inside the Site. The proposed remediation activities will result in treatment of approximately 94% of the VOCs and SVOCs relative risks, as represented by the SPLP soil data, or 82% of the total relative risks for both Sites, and containment of approximately another 8% of the total relative risks at the Midco I site for a total relative risk reduction of approximately 90% for both Sites (see Table 2-2). The additional

containment of the Midco II Site soil represented by the final cover will address exposure to the rest of the soil COCs.

The areas for soil remediation at both Sites were determined based on:

- The 1986 RI analytical data for total VOCs and SVOCs in soil samples collected from the monitoring well borings and trenches,
- The 1998 SPLP data for VOCs and SVOCs in the SPLP leachate of soil samples,
- The 2001 analytical data collected for the soil chemical oxidation treatability study,
- The VOC data for soil samples collected during the 2002 trenching activities at the Midco II Site, and
- The ground water data, listed below.

The ground water data was used to determine a general area of potential soil impact that might be affecting the ground water, and the RI, SPLP and 2002 trenching data were used to select locations for remediation. The 2001 soil analytical data were used to confirm that the RI concentrations could still be used to determine the areas to be remediated. With the exception of the 2002 test pit activities data, which are included in Appendix C, all results have previously been submitted to the USEPA.

The ground water data used to define the soil areas requiring remediation at the Midco I Site and the soil and ground water areas requiring remediation at the Midco II Site were determined based on:

- The Midco I and Midco II 2001 annual ground water monitoring results,
- The Midco I and Midco II 2001 extraction well sample analytical data, and
- The Midco II ground water data from the 2002 trenching activities.

Table 2-3 summarizes the primary sampling results used to define the areas to be treated (see Sections 3.3.2 and 4.3.2). Approximately 54,200 cubic yards (2.8 acres) of soil at the Midco I Site (including the dewatered portion of the aquifer) and 99,400 cubic yards (6 acres) of soil at the Midco II Site will be treated.

3.0 MIDCO I ALTERNATE REMEDY

As described previously, the Midco I Alternate Remedy includes a containment/ barrier wall, dewatering, SVE, bioventing and natural attenuation of inorganics. These components of the remedy, along with preliminary design details, are presented below.

The Midco I Site soils (where the majority of the organics were detected in the SPLP samples) will be treated, after dewatering to a depth of approximately 12 feet BGS, by SVE/bioventing to remove the VOCs and SVOCs. Because the area within the final fence will be surrounded by a containment/barrier wall, the oxygen provided will likely extend to the small portion of the Site that is not being directly treated by SVE and enhance biodegradation of any low levels of VOCs in those areas. Portions of the COCs in the ground water that smear into the aquifer's soils will be addressed via the SVE/bioventing system and the containment/barrier wall. Based on the 18 quarters of data for the treatment system influent at Midco I, the only organic that requires treatment prior to discharge to the deep well is methylene chloride.

Dewatering of approximately 10 feet of soil in the containment area at the Midco I Site is expected to remove most or all of the inorganics detected in the shallow ground water above the CALs, and any remaining COCs will be contained by the containment/barrier wall, thus requiring no further remediation of inorganic compounds inside the contained area.

The COCs present at levels above the CALs outside the containment/barrier wall will be addressed via natural attenuation based upon the following:

- The source area will have been contained,
- After the source area has been contained, the capture zone area outside the contained area will continue to be pumped for a period of about a year, removing about one pore volume of ground water,
- The remaining COCs will naturally attenuate over time to levels below the drinking water standards by the time they reach the downgradient users (Appendix B of the Midco I Feasibility Study), and

- There are no downgradient users of the ground water within 4,000 ft downgradient of the Site and the city of Gary may enact a ground water use prohibition.

3.1 Containment/Barrier Wall – Midco I

The Midco I Alternate Remedy includes containment of the Exclusion Zone to eliminate the principal threat at the site by permanently containing the source area and allowing soil treatment by SVE methods. Isolation of the principal threat is proposed by installation of a containment wall such as a slurry wall or equivalent barrier wall.

The containment/barrier wall would be located near the final fence. The approximate location of the containment/barrier wall is presented in Figure 4. The wall would extend to a depth of approximately 30 feet to be keyed approximately 2 feet into the low permeability silty clay stratum beneath the Midco I Site. Keying the containment/barrier wall into the underlying silty clay stratum provides an essentially water tight seal or 'bathtub' effect to contain the source area. Any soils generated during construction would be placed in the contained area for later SVE treatment.

Containment/barrier wall options are reviewed in Appendix E. Slurry walls consist of an excavated trench that is backfilled with a low permeability soil-bentonite backfill. Alternate slurry wall methods use jetting and chemically compatible cement grout slurry. These latter installation methods include the vibrating beam technique. This installation technique involves the use of an I-beam that is vibrated into the ground. Once the I-beam is in place, slurry is injected under high pressure from the base of the beam up to the ground surface. After the slurry panel is complete, the beam is removed and the rig is moved adjacent to the previous location, overlapping the previous panel to ensure continuity. An advantage of this method is that no excavation is necessary and the slurry mix is applied in pure form, thus no excess soils or air emissions are produced.

As discussed in Section 3.2 below, depending on the observed infiltration rates into the containment area during soil treatment, a gate in the containment wall may be necessary in the future for final closure to allow ground water flow out of this contained area (i.e. bathtub) after remediation is complete.

3.2 Containment Area Dewatering – Midco I

Once the containment/barrier wall has been completed, effectively isolating the Midco I Exclusion Zone, dewatering operations will be started. Dewatering activities are expected to be conducted simultaneous with SVE system construction and cover installation. Ground water contamination is primarily found in the shallow wells[4]. Dewatering (and then SVE) will be conducted on the shallow portion of the aquifer within the containment area to a depth of 12 feet below ground surface (BGS). Dewatering activities will be performed by using existing extraction wells EW-3 and EW-5. The existing GWTS will be used to treat the extracted ground water. The dewatering rate will depend on the ground water quality, and the GWTS treatment capabilities. The dewatering period is expected to be ten months to one year, based on the analytical data available for the extraction wells and the current extraction configuration flow rates of 4.3 gallons per minute (GPM) and 5.0 GPM at extraction wells EW-3 and EW-5, respectively.

After dewatering is completed, the containment may require periodic dewatering during SVE, depending on the infiltration rate. If no additional dewatering is conducted, modeling predicts that complete recharge of the containment area will occur after an approximately 10- to 15-year period. If installation of gates or regular dewatering were not performed, the ground water table within the containment would eventually rise to the ground surface, undermining the final cover.

Options to address ground water buildup inside the containment include: dewatering on a periodic basis, use of a funnel-and-gate (passive treatment), or use of a gravel (nontreatment) gate. A recommended passive dewatering method will be proposed when the SVE portion of the remedy is complete, based on actual recharge rates and ground water quality.

3.3 Soil Treatment by Soil Vapor Extraction and Bioventing – Midco I

Treatment of the soils within the exclusion zone at the Midco I Site will be accomplished by applying *in-situ* SVE technology to remove a high percentage of the

[4] Based on historical ground water data for monitoring well clusters MW-2, MW-3, MW-4, MW-5, C and D. Shallow monitoring wells are typically 10 to 12 feet deep BGS, while deep wells are 26 to 28.5 feet deep BGS.

mobile VOCs in the soils and then applying *in-situ* bioventing technology to reduce the concentrations of SVOCs and further reduce the concentrations of VOCs in the soils. The estimated total volume of soils to be directly treated at Midco I is 54,200 cubic yards. This is 49,000 cubic yards greater than the volume estimated to be treated by the ROD Remedy. Because the affected soils in the exclusion zone will already be contained within the containment/barrier wall and surface cover, the objective of treating the soils using SVE and bioventing is mass reduction of organic COCs in the source areas. Mass reduction of the organic COCs will occur primarily in and along the preferential air flow pathways, where mobile COCs can be removed and less mobile or immobile COCs may degrade as the subsurface conditions for biodegradation are enhanced. VOCs have physical characteristics that make them mobile, whereas SVOCs have physical characteristics that make them less mobile or immobile. Some mobile compounds may be trapped within the soil/debris matrix and will not migrate to the preferential airflow pathways, and some less mobile and immobile compounds will not migrate through the preferential airflow pathways. These compounds are not a priority because they are contained both within the soil matrix and within the engineered containment system.

The water table at the Midco I Site fluctuates depending on the season and, at times, the impacted soils at the Midco I Site are situated below the natural water table. As noted previously, the overall remedy includes constructing a containment/barrier wall keyed into the underlying aquitard around the exclusion zone and a surface cap over the exclusion area to isolate and contain the impacted media, thus preventing any further migration of COCs, and allowing the area to be dewatered. Dewatering the exclusion zone will cause a portion of the COCs in the ground water to adsorb onto the dewatered soils and will expose the impacted soils for treatment via SVE and bioventing.

SVE is a conventional technology that physically removes VOCs and some SVOCs from the unsaturated (vadose zone) soil. The technology involves applying vacuum-induced airflow through the subsurface and extracting the contaminated vapors in the pore space of the soil. After the first pore volume of vapors is removed, additional COC removal is limited by the rate at which the COCs adsorbed on to the soil particles and dissolved in the pore water partition (volatilize and diffuse) into the soil vapor. The vapors extracted from the soil may be treated to recover or destroy the COCs, depending

on local and state air emissions regulations. SVE is typically applicable only to volatile compounds with a Henry's law constant greater than 0.01 or a vapor pressure greater than 0.5 mm Hg; therefore, the target COCs are VOCs and some lighter SVOCs. SVE will not remove low volatility SVOCs, metals, or PCBs; however, it can promote the *in-situ* biodegradation of low-volatility organic compounds.

Bioventing is a conventional technology that enhances the natural *in-situ* biodegradation of any aerobically degradable compounds by providing oxygen to the existing soil microorganisms in the subsurface. Natural *in-situ* biodegradation processes are commonly limited by a lack of sufficient oxygen for the communities of subsurface microorganisms to metabolize the available organic compounds. Moreover, high concentrations of organic compounds can be toxic to the microbes. In contrast to SVE, bioventing uses low flow rates to provide only enough oxygen to sustain microbial activity. The oxygen is generally supplied through direct air injection into the impacted subsurface soils. Bioventing is typically applicable to petroleum hydrocarbons, nonchlorinated solvents and some other organic compounds. It is typically not effective for biodegradation of many chlorinated solvents unless there is a co-metabolite present, or an anaerobic cycle. Although bioremediation is not effective for degrading inorganic chemicals, it can be used to change the valence state of inorganics and cause adsorption, uptake, accumulation, and concentration of inorganics in micro or macro organisms. The sequestering of inorganics in the soils at the Midco I Site via bioventing may be an additional benefit of the application of this technology. Bioventing will be initiated after SVE has been used to remove a large percentage of the VOCs from the subsurface because it is a more cost effective medium-term technology for obtaining further reductions in the concentrations of organic compounds in the subsurface soils.

Treatment of the soils within the exclusion zone will decrease the mass of mobile COCs and further reduce the potential for migration to ground water within the containment/barrier wall. Moreover, treatment of the soils will reduce the potential for vapors to migrate to the ground surface and accumulate in confined spaces if the Site is developed. This component of the remedy is consistent with the objectives of the final remedy for the Midco I Site as defined in the ROD and will address the principal threat

by reducing the risk of exposure to the soil and contaminated vapors and reducing the potential migration of mobile COCs to ground water.

3.3.1 Preliminary Design Considerations – Midco I

Preliminary design of the SVE and bioventing systems for the Midco I Site included consideration of site conditions that present challenges and atypical uncertainties in the effectiveness of the systems. Specific design features related to each of these issues are summarized below.

Shallow Water Table

The natural water table is situated at an average of approximately 2 to 4 feet below ground surface at the Midco I Site, and the impacted soil and ground water extends to a depth of approximately 12 feet. Therefore, under natural conditions, the full depth of the impacted soil could not be treated via SVE or bioventing because the lower 10 feet are saturated. To address this issue, a containment/barrier wall will be constructed around the exclusion zone as described in Section 3.1, the area within the containment/barrier wall will be dewatered to a depth of approximately 12 feet below ground surface as described in Section 3.2, and a low-permeability cover will be constructed over the exclusion zone as described in Section 3.4. Preliminary calculations indicate that the ground water level in the containment area will rebound at a very low rate because of the low-permeability nature of the containment components (i.e., the silty clay basal aquiclude, containment/barrier wall and the low-permeability asphalt cover). However, the water table will be monitored during the soil remediation activities and additional dewatering will be performed as needed to maintain the water level at an approximate depth of 12 feet until the soil treatment is completed.

Mass of Organics Present in the Soils

The RI soil sampling data was used to calculate the mass of organics present in the Midco I soils. Table 3-1 presents the data and calculations performed. The procedure was as follows:

- Select the samples within the areas to be treated;
- Calculate the detected concentrations of total VOCs and total SVOCs at each RI soil sampling location included in the remediation area;
- Multiply the calculated total VOC and SVOC concentrations by a factor of 2 to account for the presence of tentatively identified compounds in the soils, as found during the RI and confirmed during the 2001 chemical oxidation treatability study;
- Estimate the area of impacted soil represented by each sample based on the distance between samples and professional judgment;
- Estimate the thickness of impacted soil represented by each sample based on the sampling depth. Each location was determined to have an impacted thickness of 12 feet because that is the approximate lower limit of the contamination and the depth to which the Site will be dewatered. This is a conservative assumption based on the likely smearing of the compounds present in the shallow ground water during the dewatering of the soils and the fact that the concentrations detected in the ground water samples result in less mass of organics than if the soil data are used. The results of the deepest soil sample collected above the water table (i.e., samples collected at depths greater than approximately 15 feet were not included) were used to estimate the mass of organics for the depth of the aquifer below that sample down to the 12 feet that will be dewatered;
- Calculate the soil volume by multiplying the area represented by each sample location by the assumed thickness of impacted soil;
- Multiply the total organic concentrations by the soil volume and a soil density of 90 pounds per cubic foot.

As shown in Table 3-1, the total mass of organics was estimated to be 360,000 pounds. A good portion of the organic mass in some of the samples used (ST-2 at 2 and 3 feet of depth, ST-4 at 3.5 and 5.5 feet of depth, MW-2 at 1.5 feet of depth, ST-8 at 3.5 and 4 feet of depth) was contributed by phthalates and PNAs, which don't volatilize to a great extent. Therefore, estimates of VOCs in vapor emissions during SVE, which are based on the calculated mass of organics, will be overestimated.

Light Nonaqueous Phase Liquid

A localized area of light nonaqueous phase liquid (LNAPL) was found at the Midco I Site during the 1998 SPLP soil sampling. The LNAPL will be addressed by first smearing it on the soil as the water table inside the inside the containment/barrier wall is dropped and then treating the smear zone via SVE and bioventing. Smearing will occur as the LNAPL migrates downward through 10 feet of dewatered soil and leaves residual product in its path. By creating this smear zone, the surface area of the LNAPL that is in contact with vapors in the pore space of the soil is greatly increased. The compounds that comprise the LNAPL transfer to the vapor phase via direct diffusion, and diffusion is proportional to the surface area of contact between the vapor and the LNAPL. Therefore, creating the smear zone will directly increase the rate at which the compounds comprising the LNAPL move into the vapor phase where they can be recovered by the SVE system. Moreover, increasing the surface area of the LNAPL also enhances biodegradation by exposing more of it to oxygen and microbes. Therefore, smearing the LNAPL across the dewatered soil matrix at the Midco I Site will increase the effectiveness of treating the COCs via SVE and bioventing.

Buried Debris

Debris such as slabs of concrete, brick, wood, plastic, waste containers, and other fill material is buried to depths of 6 feet below ground surface in some

portions of the Midco I Site. The presence of the buried debris affects both the construction and performance of the SVE and bioventing systems. Specifically, the buried debris can inhibit the installation of subsurface structures such as extraction wells, air inlet wells, and piping. To address this issue, data from previous borings and test pits will be used to select well locations that have little or no known buried debris (to be extent practicable), and the extraction and air inlet wells will be installed vertically to minimize the potential for encountering buried debris. If buried debris is encountered and cannot be penetrated, the well boring will be abandoned and a new boring will be advanced a few feet away from the initial well location. The buried debris is a greater concern for installation of the piping because most of the debris is situated within the shallow soils where the piping normally would be installed. To address this issue, the piping will be installed on the ground surface (i.e., above the buried debris) and covered. In addition to avoiding construction issues associated with encountering buried debris, this approach reduces the amount of impacted material that needs to be excavated, thereby reducing exposure during construction. Material placed over the piping will include the sediments stored on site, any excess soils generated from construction of the containment/barrier wall, a high permeability foundation sub-base layer, and a low-permeability asphalt cover (see Section 3.4).

Buried debris can affect soil treatment performance by creating voids and preferential airflow paths in the subsurface. The voids and preferential airflow paths produced by buried debris can dominate the vapor flow pattern induced by the SVE and bioventing systems. For this reason, the SVE and bioventing systems have been designed with sufficient flexibility to allow focused airflow in the areas having the highest contaminant concentrations rather than uniformly across the Site. The SVE and bioventing systems will include valves on individual extraction and air inlet wells, allowing adjustment of each well to influence the vapor flow pattern.

The concentration of COCs is likely greatest in the voids and along preferential flow pathways because these zones offer the least resistance to gravity-driven migration. These same zones will be preferential airflow paths during treatment of the soil by SVE and bioventing. Therefore, SVE will likely optimize initial recovery of COCs from the voids and preferential paths containing the highest concentrations.

Short Circuiting

SVE short-circuiting refers to the development of preferential pathways for atmospheric air to enter the airflow network induced by the SVE system resulting in the preferential extraction of atmospheric air over impacted soil vapors. Short-circuiting is a preliminary design consideration for all SVE and bioventing systems because it reduces the achievable radius of influence of the extraction well network and the effectiveness of the soil treatment. Direct airflow from the ground surface is the most common cause of short-circuiting; however, it is effectively addressed by constructing an engineered cover over the treatment area. As indicated in Section 3.4, a low permeability asphalt cover will be constructed at the Midco I Site to minimize short-circuiting. Structures that penetrate the cover, such as extraction, air inlet, and monitoring wells, will be constructed with appropriate surface seals and the piping will be constructed above the ground surface to minimize the creation of preferential flow paths in the shallow soil, thereby minimizing short circuiting along these structures. Finally, the SVE and bioventing system includes engineered air inlet wells for the controlled introduction of atmospheric air into the subsurface soils. The individual air inlet wells will be equipped with valves, allowing adjustment of the airflow, thereby influencing the vapor flow pattern.

Pilot Testing

The sequence of remedial activities necessary to address the impacted soil at the Site is not conducive to pilot testing the SVE and bioventing system prior to constructing certain major elements of the system. As previously indicated, the Site must be dewatered before the impacted soil can be addressed via SVE or bioventing; therefore, pilot testing cannot be performed before the dewatering activity is completed. Construction of the containment/barrier wall described in Section 3.1 must be completed before initiating the dewatering activities and construction of the subsurface portions of the SVE and bioventing system (i.e., the extraction and air inlet wells and connecting piping) should be performed before the surface cover is placed. Therefore, the subsurface portions of the SVE and bioventing system will be installed before the treatment area has been completely dewatered. To address this issue, the design for the subsurface portions of the SVE and bioventing system is moderately conservative. Specifically, the extraction well spacing is moderately conservative and if necessary, the air inlet wells can be converted to extraction wells to provide tighter coverage.

Property Use

Based on its location, zoning and local economic factors, the Midco I Site may have a future productive use as a support property for commercial or industrial operations, particularly since it is located in the Gary/Chicago Airport Development Zone. Possible near-term uses of the Site include developing it into truck parking or an equipment storage area. These possible near-term uses of the property were considered in the remediation design such that adequate containment structures and mitigation of any immediate risk to human health would be addressed to allow development of the Site for these purposes. Specifically, the alternate remedy includes placing an engineered cover over the exclusion area to mitigate exposure via direct contact with the impacted media and an active SVE and bioventing

system to mitigate exposure via inhalation of contaminated vapors. Moreover, the systems have been designed to minimize aboveground structures on the Site, thereby allowing it to be developed for near-term productive use.

SVE Emissions Control

The estimated average total organic emissions in the exhaust air from the SVE system over the operating life of the system is 16 pounds per hour, 380 pounds per day or 69 tons per year. The emission rate calculation is presented in Section 3.3.2. The Gary, Indiana area is classified as a Severe Non-Attainment Area for Ozone, and as such, New Source Review (NSR) regulations are triggered for new or modified sources with a potential-to-emit in excess of 25 tons per year of VOCs. At a minimum, the NSR regulations would require implementation of the Latest Achievable Control Technology (LACT). To avoid regulation under the NSR program, the SVE system has been designed to include a thermal or catalytic oxidizer that will reduce the total organic emissions to less than 25 tons per year. However, in reducing the VOC emissions, the oxidizer will be a source of hydrochloric acid (HCl) emissions. HCl is a Federal Hazardous Air Pollutant (HAP) and extensive Maximum Achievable Control Technology (MACT) regulations are triggered if a source has the potential to emit in excess of 10 tons of a single HAP. An initial analysis of the approximate rate of HCl generation indicates that the theoretical HCl emissions will be 7.0 tons per year. Because this is less than the federal limit of 10 tons per year, the SVE system design does not include an acid scrubber. If odor nuisances are found to exist due to generation of chlorine, an acid scrubber may be required.

SVE vs. Bioventing

One of the limitations of SVE is that after the initial pore volume of contaminated vapor has been removed, the rate of COC removal is limited

by the rate that VOCs absorbed onto the soil or dissolved in the pore water diffuse into the soil vapor. As an SVE system continues to operate, the subsurface conditions change such that the rate of contaminant removal decreases and eventually reaches an asymptotic level. Some of the factors that cause the decrease in COC removal rate include:

- Reduction in the mass and concentration of mobile COCs in the subsurface,
- An increase in the sorption capacity of the soil because it dries out and the relative percentage of less-mobile and immobile organic content increases,
- The less-mobile and immobile SVOCs remain in the soil, and
- The COCs in the preferential airflow paths are cleaned up leaving the COCs in the more tortuous portions of the soil matrix to be removed.

This issue can be addressed by switching the SVE operation to a bioventing mode and relying on *in situ* biodegradation instead of vapor extraction for removal of the residual organic COCs. After the extracted mass removal rate achieved by the SVE system reaches an asymptotic level, the system can be switched to a bioventing mode by simply reducing the extraction flow rate to levels that only provide enough oxygen to sustain microbial activity. Switching to the bioventing mode will result in additional source removal, including degradation of low mobility and immobile SVOCs that cannot be removed via SVE. Bioventing is an effective technology for petroleum hydrocarbon and nonchlorinated solvent COCs because those compounds are aerobically degradable. Furthermore, the chlorinated solvent COCs will likely degrade because petroleum co-metabolites are present in the soils and will likely allow co-metabolic degradation of the petroleum and chlorinated solvents. Lastly, bioventing allows more efficient use of resources by reducing power consumption and eliminating the need for emissions control.

3.3.2 Design – Midco I

The major components of the SVE system at Midco I consist of:

- Extraction wells and piping,
- Inlet wells and piping,
- Vacuum blower system,
- Condensate removal system, and
- Extracted vapor emission control system.

As previously indicated, the proposed conceptual remedy includes implementing SVE at the Midco II Site first. Once the Midco II Site's SVE remediation is complete, the vacuum blower and emission control system will be transported from Midco II to Midco I and the SVE system will be started at the Midco I Site. The components of the SVE system are described below.

Vapor Extraction Wells and Piping

A proposed layout of the vapor extraction wells is presented in Figure 5. In developing this layout, a radius of influence of 50 feet has been assumed. This is based on experience and literature information where a radius of influence in the range of 40 to 100 feet is typical in moderate to high permeability formations. As shown on Figure 5, 21 extraction wells with a 50-foot radius of influence provide complete coverage of the impacted area. The extraction wells are spaced on a triangular pattern to optimize the coverage of the extraction wells. The well spacing varies from row to row depending on the geometry of the contaminated area but is generally in the range of 70 to 80 feet, which provides sufficient overlap to allow for construction flexibility.

Each vapor extraction well includes 10 feet of screen, which would typically be set from 2 to 12 feet below ground surface. This allows two feet of riser to allow a sufficient surface seal to prevent short-circuiting. The PVC screen and riser in each well will be constructed of 4-inch diameter (polyvinyl chloride CPVC).

The wells will be installed prior to the installation of the cap, which allows the well head to be initially installed with a tee just at grade such that the lateral off the tee is at ground surface. The riser would extent off the tee to a level approximately two inches below final grade and a flush manhole will be installed to allow access to the well. The conveyance piping off each well will be 4-inch diameter PVC and for each well the piping will be independently run to a point just to the north of the impacted area into a valve house. Within the valve house, the piping from each well will include the following:

- A sample tap that can be used to obtain a sample of the extracted vapors and to measure the vacuum applied to the extraction well;
- A velocity measuring port to allow obtaining flow readings; and
- A flow control valve to allow for operational adjustments and system optimization.

The satellite valve houses provide central locations to obtain readings and make operational adjustments. The main SVE equipment area will be located near the GWTS. This type of design is appropriate for the Midco I and Midco II Sites because: (1) it does not require having an underground utility vault adjacent to each well, which would disrupt potential future uses of the Sites; and (2) it reduces the piping costs by not having to run the extra piping to the SVE equipment area.

The proposed piping arrangement is presented in Figure 5. The arrangement shown has two rows of piping joined in the western valve house and the

other two rows joined in the eastern valve house. Within each of these two valve houses, the piping from each well will be manifolded together into one single 12-inch diameter PVC header. Each of these two headers will be run to the SVE equipment area. Running the two headers independently to the SVE equipment area allows the Site to be easily divided into two cells that can automatically be cycled via electrically-actuated control valves located within the SVE equipment area.

To minimize the amount of impacted material that needs to be excavated, the piping will be installed on the ground surface and then covered with the Site's cap (see Section 3.4). The cover will provide protection from damage as well as thermal insulation, although it will not provide full protection from frost based on the area's average frost line of approximately 3 feet. Considering the fact that a containment/barrier wall, cap and dewatering system will be provided, it is not anticipated that moisture and freezing within the conveyance piping would be a major problem at this site. During the detailed design phase reasonable controls will be evaluated to minimize freezing problems, such as piping sloping, provisions for condensate removal from low points, and allowance for a manual air blow-back towards the wells.

Air Inlet Wells

Passive air inlet wells will be installed to introduce air into the impacted area and eliminate stagnant zones. This is important at the Midco I Site because air sparging is not being implemented and the impacted soil is otherwise sealed off from the surrounding environment by the containment/barrier wall and surface cap. As shown in Figure 5, a total of 21 passive air inlet wells are proposed. These wells are located around the perimeter of the impacted area and at the intersection of each internal set of three extraction wells.

The air inlet wells will be installed in a similar manner as the extraction wells with the main difference being in the piping system. Rather than running separate piping from each air inlet well, the wells will be connected to a single manifold pipe that runs down each row of inlet wells. Flow rates for passive air inlet wells are typically not controlled, rather the flow rate into each air inlet well would be controlled based on the vacuum that is induced in the area of the air inlet well. The header for each row of air inlet wells would be run to a location where the piping can rise above grade to a U-type inlet vent. Figure 5 shows these headers running to a point just outside the valve houses. Should it be determined that the well spacing is not sufficient, it is possible to convert the passive air inlet wells to either forced air inlet wells or additional extraction wells, which would help expedite remedial progress.

Vacuum Blower System

The Midco I treatment area will be divided into two operating cells that can run one at a time in a cell-sequencing mode with a total SVE flow of 1,000 cfm. The piping for each cell will include an automatic valve controlled by the SVE control panel. After the control valves, the piping will be joined together in a common header that is connected to the vacuum blower system.

Cell 1 contains the two western rows of extraction wells, with a total of 10 extraction wells and Cell 2 contains the two eastern rows of extraction wells, with a total of 11 extraction wells. With a flow of 1000 cfm, the flow per extraction well is in the range of 91 to 100 cfm, or 9 to 10 cfm per foot of screen. Based on experience, this flow is expected to be sufficient to generate the required radius of influence. If it is determined upon startup that additional extraction capacity is needed to achieve the design radius of influence, an additional blower could be added.

Another factor to be considered when sizing the blower is remediation time. The design remediation time for Midco I is 3.5 years with 1.5 years of SVE operation followed by 2 years of bioventing. It has been estimated that Midco I contains roughly 360,000 pounds of COCs over an area of approximately 110,000 square feet and 12 feet thick. To determine whether the 1000-cfm SVE capacity is sufficient, several factors were considered. A method of evaluating the blower capacity is a pore-volume approach. Typically, several hundred to 1000 pore volumes are needed to remove 90% of a contaminant mass. Assuming a porosity of 30%, one-pore volume for Midco I is 396,000 cubic feet. Over an 18-month period, a total of 1990 pore volumes would be exchanged, which exceed the typical amount needed for 90% removal.

A second method of evaluating the blower capacity is based on air volume exchanged per unit mass removed versus percent reduction. Based on the Hyperventilate model, to achieve 90% removal of gasoline constituents, 113 liters of air need to be extracted to remove one gram of contaminant mass, or 1805 cubic feet per pound. (Many of the same constituents in gasoline are the predominant compounds at the Midco I and Midco II Sites, including toluene, ethyl benzene and xylene.) To remove 90% of the 360,000 pounds of COCs at Midco I, the total volume of vapor extracted would be 650 million cubic feet. Eighteen months of operation at 1,000 cubic feet per minute (cfm) would provide 788 million cubic feet, which is 21% greater than the volume required.

Based on the assumption that 90% of the total 360,000 pounds-mass of VOCs will be removed in 18 months, the average VOC concentration in the extracted vapors can be estimated. Assuming an average molecular weight of 110, the concentration in the extracted vapors would need to be 1,400 parts per million by volume (PPMv). Although the initial concentration may be this high, or possibly higher, the average concentration will likely be

lower because even during the SVE mode of operation, a significant portion of the contaminants will be removed by biodegradation. This concentration of VOCs in the extracted vapors is feasible, so the estimated time for 90% removal of the VOC mass is adequate, and so is the blower capacity.

Based on the criteria indicated above, the 1,000-cfm flow capacity appears to be sufficient for SVE. After the system has been operated in an SVE mode for 18 months, it is anticipated that the concentration of VOCs in the extracted vapors will be less than 10%, more likely closer to 1%, of the initial concentration. At this point, the system will be switched to a bioventing mode to achieve additional source removal in a more efficient manner than with SVE. Modification from SVE to bioventing would include a reduction in the extraction flow rate such that sufficient oxygen concentrations are maintained for the aerobic biodegradation of VOCs, but emissions are minimized.

To allow sufficient oxygen for bioventing, one pore volume should be exchanged every 0.25 to 0.50 days according to EPA's *Bioventing Principals and Practices*, 1995, and every 1 to 2 days according to *Remediation Engineering Design Concepts* by Suthersan, 1997. Using the range of 0.25 to 2.0 days, the flow rate needed ranges from 138 to 1100 cfm. The mass remaining in Midco I after SVE should also be considered in determining the air flow requirement. Assuming 10% of the original 360,000 pounds remains, then 36,000 pounds are available for biodegradation over the planned two-year period, or 49.3 pounds per day. For petroleum hydrocarbons, which will likely be the remaining constituents after the 18 months of SVE, the mass of oxygen needed to degrade one pound of hydrocarbons is approximately 3.3 pounds. The percent of oxygen supplied that is utilized for biodegradation is typically in the range of 10 to 20%. Using an oxygen utilization rate of 12%, the amount of oxygen

needed to be supplied to Midco I is 1360 pounds per day, which corresponds to an air supply of 53 cfm on average over the two-year period.

However, according to EPA's *Bioventing Principals and Practices*, the bioventing half-life to toluene, ethyl benzene and xylene is in the range of 20 to 30 days. Using a more conservative 60-day half-life would result in 12 half lives during the two-year bioventing period, which would provide well over 99% removal during bioventing and well over 99.9% removal overall. Applying a 60-day half-life corresponds to an initial COC degradation rate of 300 pounds per day for the first month, which would then require an air supply rate of 325 cfm. Therefore, it is proposed to operate the bioventing system initially at an airflow rate of 500 cfm, which corresponds to a pore volume turnover rate of 0.55 days. The oxygen level in the extracted vapors would be monitored to ensure that it remains above 5% oxygen. Over time, the system will be monitored and the flow rate reduced if it is determined that a lower flow rate can supply sufficient oxygen to maintain biodegradation.

In summary, the vacuum blower must be capable of initially operating at 1,000 cfm during the SVE mode of operation and then at 500 cfm during the initial stage of bioventing. It is recommended that a short-term test be performed on several wells prior to installing the full-scale system in order to determine the vacuum required. It is anticipated at this time that a low to moderate vacuum would be required, thus a regenerative or rotary lobe type blower capable of achieving a vacuum of 100 inches vacuum would be sufficient. A positive displacement blower, such as a rotary lobe, will be installed because it is more energy efficient, although the flow rate would be reduced somewhat at increasing vacuum levels. To efficiently decrease the flow rate from 1,000 cfm for SVE application to 500 cfm for bioventing (and perhaps even a lower flow), the speed of the blower will be reduced by

changing the gears. This is a simple method to reduce flow and power consumption from a given blower.

The header piping to the vacuum blower system would be connected to a moisture separator then an in-line filter, then a dilution air inlet tee, and then the vacuum blower. The outlet of the vacuum blower would be connected to the emission control system, if required, and then the emission stack.

The moisture separator will remove liquids that were either entrained into the extraction wells as free liquid or that condensed out in the piping system. The in-line filter will remove fine solid particulates. The dilution air inlet will reduce the flow from the extraction wells and dilute the soil vapor with atmospheric air. If an oxidizer is used for emission controls, then during startup, the dilution air valve is typically wide open while the process valve to the extraction well network is closed until the oxidizer has reached a ready status. It is sometimes necessary to continuously bleed in some dilution air depending on the concentration of VOCs in the soil vapor to avoid over-loading the emission control device or if the flow rate from the extraction wells is reduced.

Regarding controls and instrumentation, the system will be equipped with:

- Vacuum/pressure gauges and temperature gauges to monitor conditions at various points through the system;
- Velocity measuring ports and sample ports to obtain flow readings and samples from the vapor extraction well header, the dilution air and the total flow from the blower;
- Automatic control valves for cell sequencing;
- Manual flow control valves for the combined extraction header and the dilution air;

- Liquid level switches to cycle the condensate pump in the moisture separator and to shut down the system if a pre-determined high liquid level is reached;
- Temperature switch on the blower outlet to prevent the system from overheating; and
- A system control panel with a programmable logic controller (PLC) and autodialer to control the cell sequencing and the condensate pump and to shutdown the system based on an alarm condition and alert the operator of the shutdown status.

In the detailed design stage, an evaluation will be made to determine whether a small building will be constructed for the equipment. The alternative is to install the vacuum blower in a separate enclosure and winterize the moisture separator and condensate pump. The control system would then be installed in a panel rated for outdoor installation with a small heater.

Condensate Removal System

If the system is initially started in cold-weather conditions, condensate may be generated in the SVE system because the soil vapor will likely be nearly saturated with ground water vapor. As the vapor cools down due to ambient temperatures being lower than subsurface temperatures, moisture may condense in the piping system. The area will remain in a dewatered state, thus as the system operates, the humidity will be reduced and condensation is not expected to be a long-term issue. To address the potential for a short-term condensation issue, the piping design will take condensate removal into account by sloping the pipe to either the extraction wells or to drip legs. Also, additional piping and manual valves may to added to the vacuum blower system to allow the flow to be periodically reversed to blower the moisture back to the wells if necessary.

As previously discussed, the vacuum blower system will include a moisture separator to remove liquids that were either entrained into the vapor extraction wells as free liquid or that condensed out in the piping system. As the liquid level in the moisture separator increases, the condensate pump will turn on and pump the liquid to the ground water treatment system (if operating) or a storage tank. Should the level continue to rise to a high level, the SVE system would be automatically shut down.

Extracted Vapor Treatment System

It is anticipated that during SVE operation, the vapors from the system will require treatment prior to being emitted to the atmosphere. As discussed under "*Vacuum Blower System*" in this section, the average concentration during the 18 months of SVE operation is anticipated to be roughly 1,400 PPMv and at a flow rate of 1,000 cfm, the average mass removal rate would be roughly 24.6 pounds per hour or 590 pounds per day. This level of emission would require controls and it is anticipated that the control device would be either a thermal or catalytic oxidizer. During the detailed design phase, an evaluation will be made to determine which device is more cost effective. Based on comparisons of the mass of chlorinated VOCs and total VOCs, it has been estimated that approximately 6% of the contaminant mass will be converted to hydrogen chloride in the oxidizer. Based on the calculated mass of organics and a 90% removal over a year of SVE, the annual mass of hydrogen chloride generated the first year is estimated to be 6 tons. This is below the Federal 10 ton per year threshold. It is currently assumed that an acid scrubber will not be required, but this will be revisited further during the design phase.

Upon startup, it may be necessary to introduce dilution air to prevent the oxidizer from being overloaded until a few pore volumes are removed. This condition would likely not last more than a few days and then it is expected that the oxidizer would be processing the full design flow of soil vapor.

Once the mode of operation is switched from SVE to bioventing, it is anticipated that emission controls would not be necessary. An evaluation will be made at that time considering total mass emission rates as well as risk factors. If it is determined that emission controls are not required, the off-gas from the bioventing system will be emitted without controls.

3.3.3 SVE Compliance and Performance Monitoring – Midco I

Compliance monitoring will be performed in accordance with applicable air emission regulations and the SOW with the modifications indicated here. During operation of the oxidizer, monitoring will include, at a minimum, continuous temperature monitoring of the oxidizer chamber to ensure that it is operating within acceptable limits. This parameter, together with periodic sampling of the oxidizer inlet and outlet for VOCs with a portable photoionization detection (PID), will be continuous indicators of the performance of the oxidizer. The oxidizer will include automatic controls that will shutdown the oxidizer and the vacuum blower if the temperature falls outside the proper operating range in accordance with the manufacturer's operating guidelines.

The periodic sampling from the oxidizer inlet and emission stack will be performed daily for the first week, weekly for the next three weeks, monthly for the next two months, and quarterly after that. The frequency may be varied after the first month if the laboratory analyses of the emission stack samples do not detect any VOCs for three consecutive samples. The oxidizer inlet samples will be analyzed for VOCs via EPA Method TO-14 and in the field with a potable PID.

Regarding performance monitoring, the SVE system will be monitored on at least a weekly basis by an operator familiar with the operation and monitoring requirements of SVE systems. On a weekly basis, the following data will be obtained:

- Flow rate from each extraction well,
- Vacuum from each extraction well, and

- VOC concentration and oxygen level from each extraction well and VOC concentrations at the oxidizer inlet and outlet.

For each vapor extraction well, the flow rate and vacuum will be measured by the use of a portable air velocity meter through the velocity ports and a portable vacuum gauge on the sample tap, respectively. VOC concentration will be measured using a portable PID, and oxygen levels will be monitored using a lower explosive level (LEL)/oxygen meter. For the oxidizer inlet and outlet, the vapor stream is under a slight pressure and therefore a tedlar bag can be filled directly from the sample tap. For the SVE wells, a sample pump will be use to fill a tedlar bag and the probes for the PID meter and the LEL/oxygen meter will then be inserted in the tedlar bag port. Flow measurements and VOC concentration of soil vapor will be used to estimate the mass removal from each extraction well. The oxygen concentration will be used to evaluate whether there is sufficient oxygen for bioremediation.

Vapor sampling of the oxidizer inlet with analysis per EPA method TO-14 will supplement the VOC monitoring discussed above. Sampling in this manner will be accompanied by field PID measurements of the oxidizer inlet. This will allow the laboratory results to be correlated to the PID reading, which will allow an estimate of the concentration of VOCs from each extraction well.

During the detailed design phase, a few existing shallow monitoring wells will be selected for use in the SVE and bioventing monitoring programs. On a quarterly basis, the following will be measured at these observation wells: depth to water, pneumatic response, VOC concentration via field PID readings, oxygen concentration via an LEL/oxygen meter, and carbon dioxide with colorimetric tubes. Prior to collecting PID, oxygen, and carbon dioxide measurements, a minimum of one volume of air will be removed from the well casing to ensure collection of representative samples from the surrounding soil formation.

During bioventing, the carbon dioxide concentration will be measured at each extraction well on a rotating frequency. Measurements will be performed quarterly, with approximately one-fourth of the extraction wells measured during

every event. Colorimetric tubes will be used to measure carbon dioxide. In addition, respiration testing will be performed on a quarterly basis to estimate the biodegradation rate. To conduct respiration testing, the SVE system must be turned off for approximately 8 to 24 hours. Immediately after turning off the SVE system, a set of oxygen measurements will be obtained from the selected observation wells. Then a second set of oxygen readings will be collected approximately 8 to 24 hours later. The second set of oxygen levels should be lower than the first due to the utilization of oxygen by microorganisms. This data can be used to calculate the oxygen uptake rate by the microorganisms. This uptake rate can then be used to stoichiometrically determine the biodegradation rate of VOCs.

3.3.4 SVE Shutdown Criteria – Midco I

Operation of the SVE system will be discontinued and switched to a bioventing mode when the SVE system has been operating for at least 12 months and asymptotic conditions have been achieved. An asymptotic condition is defined as follows: the monthly mass of total VOCs removed during three consecutive months of operation is less than 10% of the maximum mass of total VOCs removed in any prior one month period. This reduction in VOC mass is indicative of a significant decline in effectiveness of the system. Essentially, when this criterion is reached, it would take a minimum of 10 months of continued operation at the reduced mass removal rate to extract an amount equal to the maximum mass of VOCs that had been removed in a prior month. This criterion illustrates that the operation of the system has reached a point of diminishing returns. Before attempting to demonstrate asymptotic conditions, a good faith effort will be made to maximize the VOC mass removal efficiency. Efforts may include ensuring proper distribution of flow from each extraction well in an attempt to maximize mass removal rate.

Once asymptotic conditions are demonstrated, the equipment will be operated on a bioventing mode, as a polishing step, for a period of 12 to 24 months to further reduce contaminant mass loading. To determine when bioventing has reached a point of diminishing returns, biodegradation rates, as calculated by the

quarterly respiration testing, should be compared. When the biodegradation rate is less than 20% of the maximum biodegradation rate in 50% or more of the wells tested, bioventing may be discontinued. If the system has operated for more than 24 months and this condition has not been met, this criterion will be re-evaluated.

3.4 Surface Cap – Midco I

Part of the proposed alternate remedy for the Midco I Site includes the installation of a cap over the containment area to allow for SVE operations and prevent direct exposure to the soils. Following the review of the capping requirements, four capping alternative materials were considered for the cover to be installed at the Midco I Site: low-permeability asphalt, concrete, clay, and geosynthetic fabric/clay. Appendix F contains a summary of the alternatives considered for Midco I. Based on the review of the four options in terms of their respective advantages and disadvantages, and the estimated capital and operations and maintenance costs, a Low-Permeability Asphalt surface cap will be used for the site. Installation of this type of cap allows for site reuse, such as semi-tractor trailer parking and other non-intrusive activities.

Low-Permeability Asphalt capping consists of installing a high-strength, low-permeability cover over the soils to stabilize surface soil and reduce infiltration of surface water. The bitumen binder in this type of asphalt provides some flexibility, making the cap more resistant to cracks that tend to form as a result of temperature cycling and/or differential settling. The low-permeability asphalt binder will consist of specially produced, high-strength, low-permeability asphalt developed to be more durable and much less permeable than regular asphalt (i.e., a hydraulic conductivity of 1×10^{-7} cm/sec or better). Since the asphalt mix is blended at higher temperatures than standard asphalt, it contains less leachable VOCs. In addition, modifiers that contain molecular weights about 80 times the molecular weight of standard asphalt molecules are added, resulting in more stable and less reactive mixtures. The low-permeability asphalt layer typically is placed on a high-permeability foundation layer, which helps reduce the negative effects of differential settling and allows drainage.

Drainage under the low-permeability layer is necessary to prevent accumulation of small amounts of water that may leak through the low-permeability layer or migrate

upward from the soil. This water can freeze and expand during cold weather, causing frost heave damage to the asphalt cover. The surface of the cap will be appropriately sloped such that surface water will drain to the perimeter. Drainage structures will be located at the perimeter to carry the storm water to the nearby wetlands.

The Midco I final cover will consist of the following components, starting from the bottom:

- Graded and compacted soil and excavated sediments,
- A non-woven geotextile separation layer to separate the soils from the subsurface soil and the gravel base course,
- A 12± inch thick compacted gravel or crushed concrete base course layer, and
- A 4-inch thick low-permeability asphalt layer.

3.5 Pump and Treat Shutdown Criteria – Midco I

As indicated in Section 2.2, the pump and treat system at the Midco I Site will be operated until dewatering inside the containment/barrier wall is completed, which is estimated to take about one year. At that time, the Midco I extraction and treatment systems will be shut down, and the natural attenuation phase will be started. The polishing filters in the GWTS and the deep well will continue to be operated until the Midco II Site ground water remediation is completed. Moisture and condensate generated from SVE operations will be collected and processed through the GWTS as needed. If necessary, additional dewatering inside the containment/barrier wall may be performed on a periodic basis and the extracted water will be treated in the Midco I GWTS on a batch basis.

The natural attenuation phase at the Midco I Site will include the collection of ground water samples annually until: (1) the ground water meets the CALs, or (2) the downgradient wells indicate attenuation is not occurring. If natural attenuation is found not to be occurring, the extraction well(s) in the affected area will be re-started and the extracted water will be treated in the Midco I GWTS, until the ground water meets the CALs. The ground water samples will be analyzed for VOCs and metals. The monitoring wells proposed for use during the natural attenuation phase include:

- Wells where organics have been detected outside the Exclusion Zone: B-10, B-30 and P-10,
- Wells near the edge of the SOW-defined capture zone with inorganic analytes above the CALs: H-10, H-30, G-10, and G-30, and
- Downgradient wells: O-10, O-30, N-10, N-30, and P-1.

Because the source will be contained and the off-site monitoring wells near to and down gradient of the edge of the capture zone will be sampled until they meet the CALs, there is no need to perform the 3-year annual confirmatory sampling specified in the SOW after the off-site wells meet the CALs.

3.6 Miscellaneous Activities – Midco I

Sediment Area

As part of the proposed activities, the excavated sediments currently being stored under a high-density polyethylene (HDPE) cover will be spread directly over the site and beneath the sub-base of the site cap. Spreading of the sediments will be performed in a manner that minimizes volatile and fugitive dust emissions. Following spreading, compaction will be conducted to provide a suitable foundation for the site cap.

Temporary Decontamination Pad

Due to the lack of a permanent Contamination Reduction Area outside the Midco I Site, a temporary decontamination pad will be necessary during the construction activities. By providing a decontamination area, all personnel and equipment coming out of the Exclusion Zone will pass through the Contamination Reduction Area for decontamination, eliminating cross contamination hazards.

4.0 MIDCO II ALTERNATE REMEDY

The Midco II Alternate Remedy includes SVE/bioventing for soils, air sparging/biosparging and continued pump and treat for ground water, followed by natural attenuation and a possible ground water use restriction. The components of the remedy, along with preliminary design details, are presented below.

In summary, most of the Midco II Site soils where organics were detected in the SPLP samples will be treated by SVE/AS followed by bioventing/biosparging to remove the VOCs and SVOCs. The ground water COCs will be removed until their respective CALs are met, a demonstration of technical impracticability is approved, or a ground water ordinance prohibiting the use of the ground water in the Gary/Chicago Airport Development Zone is promulgated by the City of Gary and approved by the USEPA as an effective institutional control for the Site (see Section 4.3). The only organic that requires HP/UV treatment prior to discharge to the deep well at the Midco II Site, based on 24 quarters of treatment system influent sampling, is vinyl chloride.

4.1 Soil Treatment by Soil Vapor Extraction and Bioventing and Ground Water Treatment by Air Sparging and Biosparging – Midco II

Treatment of the impacted soils at the Midco II Site will be accomplished using the same technologies described in Section 3.3 for the Midco I Site (i.e., *in-situ* SVE and *in-situ* bioventing). The estimated volume of soils to be directly treated at Midco II is 99,400 cubic yards. This is 87,200 cubic yards greater than the volume estimated to be treated by the ROD Remedy. In addition to treating the impacted soils, treatment of the impacted ground water at the Site will be enhanced by using *in-situ* air sparging (AS) to remove a high percentage of the VOCs and *in-situ* biosparging to reduce the concentrations of SVOCs and further reduce the concentrations of VOCs. In contrast to Midco I, a combined soil and ground water treatment technology is proposed for this Site because:

- The impacted media extends from the shallow unsaturated soils to the deep portions of the aquifer in some areas,
- The water table at the Site is sufficiently deep that SVE can be performed without dewatering the treatment area,
- Areas of impacted water requiring treatment are sufficiently deep that treatment of the COCs in the water phase is more feasible than dewatering the area and treating the dewatered soils, and
- The existing GWETS contains the ground water plume effectively, but is not reducing the COC mass in a timely and cost effective manner.

The primary objective of treating the soils and enhancing the treatment of the ground water at the Midco II Site is mass reduction of organic COCs in the source areas. The remedy also includes constructing an engineered surface cover over the treatment areas, which will reduce the risk of direct contact with the impacted soil. Moreover, the existing GWETS will continue to be operated to contain the ground water plume and reduce the mass of COCs in the ground water while these other treatment activities are being performed.

Mass reduction of the organic COCs will occur primarily in and along the preferential airflow pathways, where mobile COCs can be removed and less mobile or immobile COCs may degrade as the subsurface conditions for biodegradation are enhanced. The only significant difference from the remedy proposed for the Midco I Site is that these processes will occur in the ground water in addition to the unsaturated soil.

In-situ AS is a conventional technology that physically removes VOCs from the ground water and saturated soil. The technology involves injecting air into the impacted aquifer, where the air travels horizontally and vertically through the saturated soil column creating a subsurface stripper that removes organic compounds by volatilization. The injected air causes the mobile COCs to migrate (bubble) up through the ground water to the unsaturated soil where the SVE system removes the vapor phase compounds. AS is designed to operate at high airflow rates to maximize the contact between the injected air and the soil and ground water, thereby stripping more volatile COCs. The rate of COC

removal is controlled by the rate at which the COCs dissolved in the ground water and absorbed on the soil particles partition (volatilize and diffuse) into the injected air. AS is typically only applicable to volatile compounds with a Henry's law constant greater than 0.01 or a vapor pressure greater than 0.5 mm Hg; therefore, the target COCs are VOCs and some lighter SVOCs. AS will not remove low volatility SVOCs, metals, or PCBs; however, it can promote the *in-situ* biodegradation of low-volatility organic compounds.

Biosparging is a conventional technology that enhances the natural *in-situ* biodegradation of any aerobically degradable compounds by providing oxygen to the indigenous microorganisms in the ground water. It operates using the same principles described in Section 3.3 for bioventing except that it occurs in the saturated zone instead of the unsaturated zone. In contrast to AS, biosparging uses low flow rates to provide only enough oxygen to sustain microbial activity. Like AS, the oxygen is supplied through direct air injection into the impacted aquifer. Biosparging is typically applicable to petroleum hydrocarbons, nonchlorinated solvents and some other organic compounds. It is typically not effective for biodegradation of many chlorinated solvents unless there is a co-metabolite present, or an anaerobic cycle. Although biosparging is not effective for degrading inorganic chemicals, it can be used to change the valence state of inorganics and cause adsorption, uptake, accumulation, and concentration of inorganics in micro or macro organisms. The sequestering of inorganics in the ground water at the Midco II Site via biosparging may be an additional benefit of applying this technology. Biosparging will be initiated after AS has been used to remove a large percentage of the VOCs from the impacted ground water because it is a more cost effective medium term technology for obtaining further reductions in the concentrations of organic compounds in the ground water.

Treatment of the soils and the ground water hot spots at the Midco II Site will decrease the mass of mobile COCs and further reduce the potential for COC migration on site and off site. Moreover, treatment of the soils and ground water will reduce the potential for vapors to migrate to the ground surface and accumulate in confined spaces if the Site is developed. This component of the remedy is consistent with the objectives of the final remedy for the Midco II Site as defined in the ROD and will address the principal threat by reducing the risk of exposure to the soil, ground water and

contaminated vapors and reducing the potential migration of mobile COCs in the ground water.

4.1.1 Preliminary Design Considerations – Midco II

Preliminary design of the soil treatment and enhanced ground water treatment system for the Midco II Site included consideration of site conditions that present challenges and atypical uncertainties in the effectiveness of the system. Specific design features related to each of these issues are summarized below.

Location of the Impacted Media

The impacted media at the Midco II Site extends from the ground surface to a depth of approximately 45 feet. The approximate maximum depth of the ground water table at the Site is 10 feet; therefore, there is a sufficient thickness of unsaturated soil at the Site to allow in situ treatment of the soils using SVE/bioventing without the need to dewater the soils. However, the full thickness of the impacted media cannot be treated via SVE/bioventing alone because much of the impacted media is saturated. Typically, operation of a GWETS like the one installed at the Site is an inefficient way of reducing the mass of COCs in the ground water. To address this issue, treatment of the saturated soils and ground water will be enhanced by using AS and biosparging.

Mass of Organics Present at the Site

Mass of Organics Present in Soil

The soil sampling data obtained during the RI and the 2002 trenching activities were used to estimate the mass of organics present in the Midco II soils. Table 4-1 presents the data and calculations performed. The procedure followed was the same used for determining the mass of organics at the Midco I Site, with the exceptions that each location was assigned a total depth of 10 feet, which is the approximate maximum depth to the water

table. Although the water table is higher at several sampling and monitoring locations, a uniform depth of 10 feet provides a conservative estimate of the mass of organics in the Site soils. For the 2002 trench samples, an estimate of the impacted depth was used, based on field observations.

As shown in Table 4-1, the total mass of organics in the soils was estimated to be 186,600 pounds. This mass is mostly VOCs; the contribution of SVOCs to the total organic mass is lower at the Midco II Site than at the Midco I Site.

Mass of Organics Present in Ground Water

The 2001 annual ground water data for VOCs and the 1997 annual ground water data for SVOCs in the monitoring well samples were used to calculate the mass of organics present in the Midco II ground water.[5] Table 4-2 presents the data and calculations performed. The procedure was as follows:

- Select the samples within the areas to be treated.
- Calculate the total detected concentrations of VOCs and SVOCs at each sampling location included in the remediation area.
- Multiply the total VOC and SVOC concentrations by a factor of 2 to account for the tentatively identified compounds found at the Site.
- Estimate the area of impacted ground water represented by each sample based on the distance between samples and professional judgment.
- Estimate the thickness of impacted ground water represented by each sample based on the sampling depth. Each location was determined to have an impacted thickness of half the aquifer thickness or 22.5 feet.

[5] SVOCs were not analyzed in the monitoring well samples collected between 1998 and 2002.

- Calculate the volume of impacted ground water by multiplying the area represented by each sample location by the assumed thickness of impacted ground water and the porosity (assumed to 0.3).
- Multiply the total organic concentrations by the ground water volume.

As shown in Table 4-2, the total mass of organics in the ground water was estimated to be 10,200 pounds. VOCs constitute most of this mass; the contribution of SVOCs is marginal.

Organic Mass Summary

The total mass of organics calculated for both the soil and ground water at the Midco II Site was estimated to be 196,800 pounds. Because VOCs constitute most of the mass, estimates of VOCs in vapor emissions during SVE/AS, which are based on the calculated mass of organics, will be appropriate.

Light Nonaqueous Phase Liquid

Several localized areas of LNAPL were tentatively identified at the Midco II Site during previous soil and ground water sampling events. To more accurately determine the extent and amount, if any, of LNAPL at the Site, nine test pits were excavated to ground water in the vicinity of the old filter bed area, where indications of LNAPL had been previously noted. This work was performed in March 2002 (see Appendix C). No LNAPL layers were observed on the ground water in any of the test pits; however, a sheen was noted at several of the locations. Samples of the ground water that produced the sheen showed high concentrations of ethyl benzene, toluene and xylene, but not high enough to be considered indicative of an LNAPL. Based on these findings, no special remedial design is necessary to address LNAPL at the Midco II Site. The identified sheen is believed to be sufficiently thin that it can be addressed using the proposed remedial technologies without special design considerations.

Buried Debris

Debris such as slabs of concrete, brick, wood, plastic, waste containers, and other fill material is buried to depths of 10 feet below ground surface in some portions of the Midco II Site. The presence of the buried debris affects the construction of the SVE/bioventing and AS/biosparging system and performance of the SVE/bioventing system. Buried debris can inhibit the installation of subsurface structures such as vapor extraction wells, air injection wells, and piping. To address this issue, data from previous borings and test pits will be used to select well locations that have little or no known buried debris (to the extent practicable), and the extraction and air injection wells will be installed vertically to minimize the potential for encountering buried debris. If buried debris is encountered and cannot be penetrated, the well boring will be abandoned and a new boring will be advanced a few feet away from the initial well location.

The buried debris is a greater concern for installation of the piping because most of debris is situated within the shallow soils where the piping normally would be installed. This issue will be addressed in the same manner proposed for the Midco I Site. Specifically, the piping will be installed on the ground surface (i.e., above the buried debris) and covered. In addition to avoiding construction issues associated with encountering buried debris, this approach reduces the amount of impacted material that needs to be excavated, thereby reducing exposure during construction. Material placed over the piping will include the sediments stored on site, a high permeability foundation sub-base layer, and a low permeability soil cover (see Section 4.3).

As indicated in Section 3.3.1 for the Midco I Site, buried debris can affect treatment performance by creating voids and preferential airflow paths in the subsurface. The voids and preferential airflow paths produced by buried

debris can dominate the vapor flow pattern induced by the SVE/bioventing and AS/biosparging system. For this reason, the system has been designed with sufficient flexibility to allow focused airflow in the areas having the highest COC concentrations rather than uniformly across the Site. The system will include valves on individual vapor extraction and air injection wells, allowing adjustment of each well to influence the vapor flow pattern.

The concentration of COCs is likely greatest in the voids and along preferential flow pathways because these zones offer the least resistance to gravity-driven migration. These same zones will be preferential airflow paths during treatment of the soil and ground water. Therefore, the proposed treatment system will likely optimize initial recovery of COCs from the voids and preferential paths containing the highest concentrations.

Short Circuiting and Capture of Vapors Generated by Air Sparging

Short-circuiting is a preliminary design consideration for the Midco II Site for the same reasons indicated for the Midco I Site (Section 3.3.1). As indicated in Section 4.3, a low-permeability soil cover will be constructed at the Midco II Site to minimize short-circuiting. Structures that penetrate the cover, such as vapor extraction, air inlet and monitoring wells, will be constructed with appropriate surface seals and the piping will be constructed above the ground surface to minimize the creation of preferential flow paths in the shallow soil, thereby minimizing short circuiting along these structures. Finally, the AS/biosparging system includes engineered air injection wells for the controlled introduction of atmospheric air into the aquifer and subsurface soils. The individual air injection wells will be equipped with valves, allowing adjustment of the airflow, thereby influencing the vapor flow pattern in the unsaturated zone.

Capture of AS-induced contaminated vapors is a preliminary design consideration for all AS systems because the uncontrolled migration of

contaminated vapors can lead to increased exposure risk. To address this issue, the SVE system is designed to extract soil vapor at four times the rate that the AS system is injecting air. This safety factor will ensure that vapors generated by the AS system will be captured by the SVE system. Moreover, the layout of the SVE and AS wells is such that the radius of influence of the SVE wells extends beyond the radius of influence of the AS wells to ensure capture of the vapors produced by the AS wells (Section 4.1.2).

Pilot Testing

An SVE/AS pilot test will be performed at the Midco II Site prior to construction of the full-scale system. The rationale for conducting a pilot test at the Midco II Site and not the Midco I Site is as follows:

- Optimizing the well spacing at the Midco II Site is more critical than at the Midco I Site because the proposed system is less adaptable (i.e., the air injection wells used for air sparging at the Midco II Site are unlike the air inlets at the Midco I Site in that they cannot be converted to SVE wells in the event that additional coverage is necessary);
- Optimizing the well spacing at the Midco II Site is critical to developing a cost effective system because of the large number of wells needed to cover the treatment areas;
- Vacuum and flow rate data from the pilot test can be used to properly size the SVE blower at both Sites because the Site soils are similar;
- Emissions data from the pilot testing can be used to properly size the emissions control equipment for both Sites because the COCs are similar for both Sites; and
- The sequence of remedial activities does not allow for performing a pilot test at the Midco I Site, but it does at the Midco II Site.

The pilot testing activities will consist of: (1) installing one air injection well to a depth of 45 feet, one vapor extraction well to a depth of 12 feet, and five

observation wells to a depth of 15 feet each; (2) operating the AS and SVE wells at multiple pressure/vacuum and flow rate combinations over a two- to three-day period and recording pressure/vacuum, oxygen, helium, PID and water level readings for each of the injection, vapor extraction, and observation wells; (3) collecting and analyzing a series of air emissions samples; and (4) evaluating the test data to determine the radius of influence of the AS and SVE wells, the design pressure, vacuum and flow rates, and the likely emissions from the systems. These data will be used to finalize the layout and design of the systems for both Sites.

According to 326 IAC 2-1.1-3(g)(3)(E), emissions generated from a 24- to 72-hour pilot test used to design a soil or ground water remediation system in Indiana do not require control. It appears that IDEM must approve extending the duration of the pilot test without emissions control beyond 24 hours. Therefore, the proposed SVE/AS pilot test does not include emissions controls other than those needed for site safety purposes.

Property Use

Based on its location and zoning and ongoing planning activities of the Gary/Chicago Airport Authority, the Midco II Site may have a future productive use as part of the Gary/Chicago Airport Development Zone. Possible uses of the Site identified in the planning documents of the Gary/Chicago Airport Development Zone include being part of a taxiway and/or runway for the airport, or as a support facility. These possible uses of the property were considered in the remediation design such that adequate containment structures and mitigation of any immediate risk to human health would be addressed to allow development of the Site for these purposes. Specifically, the alternate remedy includes flexibility to place an engineered cover over the treatment area to mitigate exposure via direct contact with the impacted media and an active SVE/bioventing system is proposed to mitigate exposure via inhalation of contaminated vapors. As

indicated in Section 4.2, the nature of the engineered cover to be used at the Site will ultimately depend on the long-term plans of the Gary/Chicago Airport Authority. Moreover, the systems have been designed to minimize aboveground structures on the Site, thereby allowing it to be developed for near-term productive use.

SVE Emissions Control

The estimated average total organic emissions in the exhaust air from the SVE system over the operating life of the system is 20.2 pounds per hour, 485 pounds per day or 88.5 tons per year. The emission rate calculation is presented in Section 4.1.2. As indicated in Section 3.3.1, the Gary, Indiana area is classified as a Severe Non-Attainment Area for Ozone, and as such, NSR regulations are triggered for new or modified sources with a potential-to-emit in excess of 25 tons per year of VOCs. To avoid regulation under the NSR program, the SVE system has been designed to include a thermal or catalytic oxidizer that will reduce the total organic emissions to less than 25 tons per year. However, in reducing the VOC emissions, the oxidizer will be a source of hydrochloric acid (HCl) emissions. HCl is a HAP, and extensive MACT regulations are triggered if a source has the potential to emit in excess of 10 tons of a single HAP. An initial analysis of the approximate rate of HCl generation indicates that the theoretical HCl emissions will be 6.3 tons per year. Because this is less than the federal limit of 10 tons per year, the SVE system design does not include an acid scrubber. If odor nuisances are found to exist due to generation of chlorine, an acid scrubber may be required.

SVE/AS vs. Bioventing/Biosparging

As indicated in Section 3.3.1, one of the limitations of SVE is that after the initial pore volume of contaminated vapor has been removed, the rate of COC removal is limited by the rate that VOCs diffuse into the soil vapor. The rate limiting factor for AS is also the rate of VOCs diffusion.

Therefore, as an SVE/AS system continues to operate, the subsurface conditions change such that the rate of contaminant removal decreases and eventually reaches an asymptotic level. Some of the factors that cause the decrease in COC removal rate were described in Section 3.3.1.

This issue can be addressed by switching the SVE/AS operation to a bioventing/biosparging mode and relying on in situ biodegradation instead of venting for removal of the residual organic COCs. After the extracted mass removal rate achieved by the SVE/AS system reaches an asymptotic level, the system can be switched to a bioventing/biosparging mode by simply reducing the air injection and extraction flow rates to levels that only provide enough oxygen to sustain microbial activity. Switching to the bioventing/biosparging mode will result in additional source removal, including degradation of low mobility and immobile SVOCs. Bioventing/biosparging is an effective technology for petroleum hydrocarbon and nonchlorinated solvent COCs because those compounds are aerobically degradable. Furthermore, the chlorinated solvent COCs will likely degrade because petroleum co-metabolites are present in the soils and ground water and will likely allow co-metabolic degradation of the petroleum and chlorinated solvents. Lastly, bioventing/biosparging allows more efficient use of resources by reducing power consumption and eliminating the need for emissions control.

4.1.2 SVE/Air Sparge System Design – Midco II

The major components of the SVE/AS system at Midco II consist of:

- Sparge wells, vapor extraction wells, and piping;
- Air sparge blower;
- Vacuum blower system;
- Condensate removal system; and
- Extracted vapor emission control system.

The components of the SVE/AS system are described below.

Sparge Wells, Vapor Extraction Wells, and Piping

A proposed layout showing the air injection wells, vapor extraction wells, and piping is presented in Figure 6. The area of remediation will be divided into four cells as described below:

- Cell 1: the northernmost cell consists of two rows of SVE wells and three rows of sparge wells totaling 7 SVE wells and 18 sparge wells;
- Cell 2: just to the south of Cell 1, consists of one row of SVE wells and two rows of sparge wells totaling 5 SVE wells and 19 sparge wells;
- Cell 3: just to the south of Cell 2, consists of two rows of SVE wells and two rows of sparge wells totaling 8 SVE wells and 14 sparge wells; and
- Cell 4: in the southern portion of Midco II, consists of six rows of SVE wells and five rows of sparge wells totaling 10 SVE wells and 11 sparge wells.

Therefore, the Midco II site will have a total of 30 SVE wells and 62 sparge wells.

Sparge Wells

For the sparge wells, a radius of influence of 30 feet has been assumed. Since a pilot test will be conducted prior to the final design, this value and the subsequent placement of the sparge wells will likely be revised.

Each sparge well includes 5 feet of screen, which would typically be set from 40 to 45 feet below ground surface. Each well would include a 2-inch diameter PVC screen and riser.

The sparge wells will be installed prior to the installation of the cap, which allows the well head to be initially installed with a tee just at grade such that the lateral off the tee is at ground surface. The riser would extend off the tee to a level approximately two inches below final grade and a flush manhole will be installed to allow access to the well after the cap has been installed.

Vapor Extraction Wells

For the SVE extraction wells, a radius of influence of 65 feet has been assumed. This is based on experience and literature information where a radius of influence in the range of 40 to 100 feet is typical in moderate to high permeability formations. The locations of the wells were selected to provide coverage of the sparge wells. However, a pilot test will be conducted to more accurately predict the radius of influence. Accordingly, this layout may be revised during the final design stage.

Each vapor extraction well includes 10 feet of screen, which would typically be set from 2 to 12 feet below ground surface. This provides 2 feet of riser to allow a sufficient surface seal to prevent short-circuiting. Each well would include a 4-inch diameter PVC screen and riser.

The wells will be installed prior to the installation of the cap, which allows the well head to be initially installed with a tee just at grade such that the lateral off the tee is at ground surface. The riser would extend off the tee to a level approximately 2 inches below final grade and a flush manhole will be installed to allow access to the well after the cap has been installed.

Piping

The piping off each vapor extraction well will be 4-inch diameter PVC. The piping will be two-inch PVC for each sparge well. For each of the four cells, the conveyance piping will be run independently to one of four valve

houses. Within the valve house, the piping from each vapor extraction well will include the following:

- A sample tap that can be used to obtain a sample of the extracted vapors and to measure the vacuum applied to the vapor extraction well,
- A velocity measuring port to allow obtaining flow readings, and
- A flow control valve to allow for operational adjustments and system optimization.

The piping for each sparge well will include the following:

- A pressure gauge,
- A flow monitoring port, and
- A flow control valve to allow for operational adjustments and system optimization.

The satellite valve houses provide central locations to obtain readings and make operational adjustments. The main SVE/AS equipment area will be located just east of Cell 3. This type of design is more adequate for the Midco II Site because: (1) it does not require having an underground utility vault adjacent to each well, which would disrupt potential future uses of the Sites; and (2) it reduces the piping costs by not having to run the extra piping to the SVE/AS equipment area.

Within each of these four valve houses, the piping from each extraction well will be manifolded together into one single 12-inch diameter PVC header. The sparge piping will be manifolded into one single 6-inch diameter PVC header. Each of these eight headers (4 SVE and 4 sparge) will be run to the SVE/AS equipment area. Running the eight headers independently to the SVE/AS equipment area allows the site to be easily divided into four cells

that can automatically be cycled via electrically actuated control valves located within the SVE/AS equipment area.

To minimize the amount of impacted material that needs to be excavated, all on-site piping will be installed on the ground surface and then covered with the soil cover. The cover will provide protection from damage as well as thermal insulation, although it will not provide full protection from frost based on the area's average frost line of approximately 3 feet. During the detailed design phase, reasonable controls will be evaluated to minimize freezing problems, such as piping sloping, provisions for condensate removal from low points, and allowance for a manual air blow-back towards the extraction wells.

Air Sparge Blower

The air sparge blower capacity was determined by calculating the amount of air needed to aerobically biodegrade all the contaminant mass. This calculation is conservative because it assumes that all VOCs are located in the saturated zone and are therefore not affected by the SVE system. The total mass (adsorbed to soil and dissolved in ground water) of organics in the Midco II remediation area is estimated at 196,800 pounds. If all organics are assumed to be xylene (one of the most common VOCs in the remediation area), then 3.2 pounds of oxygen is needed to aerobically biodegrade one pound of xylene. Therefore, using an oxygen utilization rate of 12%, 5.25 million pounds of oxygen must be supplied. Over a two-year period (assume one year of SVE/AS and one year of bioventing/biosparging), this corresponds to 7,189 pounds of oxygen per day, which is equivalent to 314 cfm. To provide an adequate safety factor and to provide sufficient air for each sparge well, a 500 cfm capacity is proposed. With a 500-cfm sparge capacity, the flow per sparge well would be in the range of 25 to 45 cfm depending on which cell is on-line.

A positive displacement blower was selected as the sparge blower because of its ability to meet the flow rate of 500 cfm, while also meeting the pressure requirements to inject the air into the saturated zone. During the pilot test, the pressure needed for sparging will be determined but it is likely that it will be in the range of 15 to 20 psig. At this range of pressures, two rotary lobe blowers will be needed in-series with an intercooler and an aftercooler. The aftercooler will be capable of reducing the blower discharge to within approximately 20°F of the ambient temperature. The reduction in temperature protects the PVC sparge piping, which begins to show a decrease in integrity above 140°F. To further protect the sparge piping, a high temperature switch will be provided at the outlet of the aftercooler to shut down the sparge blower at elevated temperatures.

Other control and instrumentation features of the sparge blower system include:

- Vacuum/pressure gauges and temperature gauges to monitor conditions at various points through the system,
- Automatic control valves for cell sequencing,
- Manual flow control valves for the combined extraction header,
- Manual vent valve to divert air to the atmosphere and reduce flow to the sparge wells,
- Temperature switch on the blower outlet to prevent the system from overheating,
- Interlock to prevent sparge blower from operating if the SVE system is offline, and
- A system control panel with a PLC and autodialer to control the cell sequencing and to shutdown the system based on an alarm condition and alert the operator of the shutdown status.

Vacuum Blower System

The Midco II remediation area will be divided into four operating cells that can run one or two at a time in a cell-sequencing mode with a total SVE flow of 2,000 cfm. The piping for each cell will include an automatic valve controlled by the SVE control panel. After the control valves, the piping will be joined together in a common header that will be connected to the vacuum blower system.

The 2,000-cfm SVE flow results in a ratio of SVE to sparge flow of 4:1, which provides a great deal of flexibility in terms of ensuring that pneumatic control of the sparge flow is maintained. During biosparge/bioventing, the SVE flow will be reduced to 1,000 cfm, which would be more appropriate for a biovent application. During the pilot test, information will be gathered in order to determine the vacuum required. It is anticipated at this time that a low to moderate vacuum would be required, thus a regenerative or rotary lobe type blower capable of achieving a vacuum of 100 inches would be sufficient. A positive displacement blower, such as a rotary lobe, will be installed because it is more energy efficient. To decrease the flow rate from 2,000 cfm for SVE application to 1,000 cfm for bioventing, it is proposed that two 1,000 cfm blowers be used initially and one of these two blowers would then be removed from the Midco II site and used at the Midco I site.

The header piping to the vacuum blower system will be connected to a moisture separator, followed by an in-line filter, a dilution air inlet tee, and the vacuum blower. The outlet of the vacuum blowers would be connected to the emission control system, if required, and then the emission stack.

The moisture separator will remove liquids that were either entrained into the vapor extraction wells as free liquid or that condensed out in the piping system. The in-line filter will remove fine solid particulates. The dilution air inlet will reduce the flow from the vapor extraction wells and dilute the soil vapor with atmospheric air. If an oxidizer is used for emission controls,

then during startup the dilution air valve is typically wide open while the process valve to the extraction well network is closed until the oxidizer has reached a ready status. It is sometimes necessary to continuously bleed in some dilution air depending on the concentration of VOCs in the soil vapor to avoid over-loading the emission control device or if the flow rate from the extraction wells is reduced.

Regarding controls and instrumentation, the system will be equipped with:

- Vacuum/pressure gauges and temperature gauges to monitor conditions at various points through the system;
- Velocity measuring ports and sample ports to obtain flow readings and samples from the extraction well header, the dilution air and the total flow from the blower;
- Automatic control valves for cell sequencing;
- Manual flow control valves for the combined extraction header and the dilution air;
- Liquid level switches to cycle the condensate pump in the moisture separator and to shut down the system if a pre-determined high liquid level is reached;
- Temperature switch on the blower outlet to prevent the system from overheating;
- Interlock to prevent SVE blower from operating if the oxidizer is offline; and
- A system control panel with a PLC and autodialer to control the cell sequencing and the condensate pump and to shutdown the system based on an alarm condition and alert the operator of the shutdown status.

In the detailed design stage, an evaluation will be made to determine whether a small building will be constructed for the equipment. The alternative is to install the vacuum blower in a separate enclosure and winterize the moisture separator and condensate pump. The control system

would then be installed in a panel rated for outdoor installation with a small heater.

Condensate Removal System

If the system is initially started in cold-weather conditions, condensate may be generated in the SVE system because the soil vapor will likely be nearly saturated with ground water vapor. As the vapor cools down due to ambient temperatures being lower than sub-surface temperatures, moisture may condense in the piping system. To address the potential for a condensation issue, the piping design will take condensate removal into account by sloping the pipe to either the extraction wells or to drip legs. Also, additional piping and manual valves may be added to the vacuum blower system to allow the flow to be periodically reversed to blow the moisture back to the wells if necessary.

As previously discussed, the vacuum blower system will include a moisture separator to remove liquids that were either entrained into the extraction wells as free liquid or that condensed out in the piping system. As the liquid level in the moisture separator increases, the condensate pump will turn on and pump the liquid to the ground water treatment system. Should the level continue to rise to a high level, the SVE system would be automatically shut down. During the detailed design phase, an evaluation will be done to determine whether it is necessary to run an interlock signal from the ground water treatment plant to the condensate pump to shut down the condensate pump if the ground water treatment plant cannot accept any flow.

Extracted Vapor Treatment System

It is anticipated that during SVE/AS operation, the vapors from the system will require treatment prior to being emitted to the atmosphere. Assuming 90% of the total COC mass of 196,800 pounds is removed in 12 months, the average mass removal rate would be roughly 20.2 pounds per hour or 485

pounds per day. This level of emissions would require controls and it is anticipated that the control device would be either a thermal or catalytic oxidizer. During the detailed design phase, an evaluation will be made to determine which device is more cost effective. Based on comparisons of the mass of chlorinated VOCs and total VOCs, it has been estimated that approximately 7.5% of the COC mass will be converted to hydrogen chloride in the oxidizer. Therefore, the annual mass of hydrogen chloride generated during the first year is estimated to be 6.6 tons. This is below the Federal 10 ton per year threshold. It is currently assumed that an acid scrubber will not be required. However, during the detailed design phase, this will be revisited considering air dispersion modeling and human health risks to determine whether a scrubber would be needed to control the hydrogen chloride vapors generated during the oxidation of chlorinated VOCs.

Upon startup, it may be necessary to introduce dilution air to prevent the oxidizer from being overloaded until a few pore volumes are removed. This condition would likely not last more than a few days and then it is expected that the oxidizer would be processing the full design flow of soil vapor.

Emission controls are not expected to be required after one year of SVE/AS. After an estimated 12 months, the system would be switched to a biovent mode at 1,000 cfm as indicated under "*SVE/Bioventing Shutdown Criteria-Midco II*" below. At that time, an evaluation will be made considering total mass emission rates as well as risk factors. If it is determined that emission controls are not required, the off-gas from the bioventing system will be emitted without controls and the oxidizer would be moved to Midco I.

4.1.3 Compliance and Performance Monitoring – Midco II

Compliance monitoring will be performed in accordance with applicable air emission regulations and the SOW with the modifications indicated here.

During operation of the oxidizer, monitoring will include, at a minimum, continuous temperature monitoring of the oxidizer chamber to ensure that it is operating within acceptable limits. This parameter, together with periodic sampling of the oxidizer inlet and outlet for VOCs with a portable PID, will be a continuous indicator of the performance of the oxidizer. The oxidizer will include automatic controls that will shut down the oxidizer and the vacuum blower if the temperature falls outside the proper operating range in accordance with the manufacturer's operating guidelines.

The periodic sampling from the oxidizer inlet and emission stack will be performed daily for the first week, weekly for the next three weeks, monthly for the next two months, and quarterly after that. The frequency may be varied after the first month if the laboratory analyses of the emission stack samples do not detect any VOC for three consecutive samples. The oxidizer inlet samples will be analyzed for VOCs via EPA Method TO-14 and in the field with a portable PID.

Regarding performance monitoring, the SVE/AS system will be monitored on at least a weekly basis by an operator familiar with the operation and monitoring requirements of SVE systems. On a weekly basis, the following data will be obtained:

- Flow rate to each sparge well,
- Pressure to each sparge well,
- Flow rate from each extraction well,
- Vacuum from each extraction well, and
- VOC concentration and oxygen level from each vapor extraction well and VOC concentrations at the oxidizer inlet and outlet.

For each vapor extraction well, the flow rate and vacuum will be measured by the use of a portable air velocity meter through the velocity ports and a portable vacuum gauge on the sample tap, respectively. VOC concentration will be measured using a portable PID, and oxygen levels will be monitored using a LEL/oxygen meter. For the oxidizer inlet and outlet, the vapor stream is under a

slight pressure and therefore a tedlar bag can be filled directly from the sample tap. For the SVE wells, a sample pump will be use to fill a tedlar bag and the probes for the PID meter and the LEL/oxygen meter will then be inserted in the tedlar bag port. Flow measurements and VOC concentration of soil vapor will be used to estimate the mass removal from each extraction well. The oxygen concentration will be used to evaluate whether there is sufficient oxygen for bioremediation.

Vapor sampling of the oxidizer inlet with analysis per EPA method TO-14 will supplement the VOC monitoring discussed above. Sampling in this manner will always be accompanied by field PID measurements of the oxidizer inlet. This will allow the laboratory results to be correlated to the PID reading, which will allow an estimate of the concentration of VOCs from each extraction well.

During the detailed design phase, a few existing shallow monitoring wells will be selected for use in the SVE/AS and bioventing/biosparging monitoring programs. On a quarterly basis, the following will be measured at these observation wells: depth to water, dissolved oxygen concentration, pneumatic response, VOC concentration via field PID readings, oxygen concentration via an LEL/oxygen meter, and carbon dioxide with colorimetric tubes. Prior to collecting PID, oxygen, and carbon dioxide measurements, a minimum of one volume of air will be removed from the well casing to ensure collection of representative samples from the surrounding soil formation.

During bioventing/biosparging, the carbon dioxide concentration will be measured at the well heads of each extraction well on a rotating frequency. Measurements will be performed quarterly, with approximately one-fourth of the extraction wells measured during every event. Colorimetric tubes will be used to measure carbon dioxide. In addition, respiration testing will be performed on a quarterly basis to estimate the biodegradation rate. To conduct respiration testing, the SVE system must be turned off for approximately 8 to 24 hours. Immediately after turning off the SVE system, a set of oxygen measurements will be obtained from the selected observation wells. Then a second set of oxygen readings will be collected approximately 8 to 24 hours later. The second set of oxygen levels

should be lower than the first due to the utilization of oxygen by microorganisms. This data can be used to calculate the oxygen uptake rate by the microorganisms. This uptake rate can then be used to stoichiometrically determine the biodegradation rate of VOCs.

4.1.4 SVE/AS Shutdown Criteria – Midco II

Operation of the SVE/AS system will be discontinued and switched to a bioventing/biosparging mode when the SVE/AS system has been operating for at least 9 months and asymptotic conditions are achieved. An asymptotic condition is defined as follows: the monthly mass of total VOCs removed during three consecutive months of operation are less than 10% of the maximum mass of total VOCs removed in any prior one month period. This reduction in VOC mass is indicative of a significant decline in effectiveness of the system. Essentially, when this criterion is reached, it would take a minimum of 10 months of continued operation at the reduced mass removal rate to extract an amount equal to the maximum mass of VOCs that had been removed in a prior month. This criterion illustrates that the operation of the system has reached a point of diminishing returns. Before attempting to demonstrate asymptotic conditions, a good faith effort will be made to maximize the VOC mass removal efficiency. Efforts may include ensuring proper distribution of flow from each extraction well in an attempt to maximize mass removal rate.

Once asymptotic conditions are demonstrated, the equipment will be operated on a bioventing/biosparging mode, as a polishing step, for a period of 12 to 24 months to further reduce COC mass loading. To determine when bioventing/biosparging has reached a point of diminishing returns, biodegradation rates as calculated by the quarterly respiration testing, should be compared. When the biodegradation rate is less than 20% of the maximum biodegradation rate in 50% or more of the wells tested, bioventing/biosparging may be discontinued. If the system has operated for more than 24 months and this condition has not been met, this criterion will be re-evaluated.

4.2 Surface Cap – Midco II

The proposed remedy for the Midco II Site includes the installation of a soil cover over a portion of the site to allow for SVE operations and a future cover to prevent exposure by direct contact with the impacted soil. However, the type of cover at the Midco II Site will ultimately depend on the long-term plans of the Gary/Chicago Airport Authority. The Gary/Chicago Airport Authority plans to use the area northeast of Industrial Highway for taxiways, runways or other support facilities and it may be more efficient for future development to use materials other than those typically used for an environmental cover. The ultimate cap will be selected in consultation with the City of Gary. It is possible that the Airport Authority would prefer to take responsibility for the construction of the cap or to underwrite a more suitable cap for the airport expansion.

The cap will likely extend across the ditch at the north end of the site. In the ditch area, the base course will be underlain by a geogrid and geofabric and granular backfill.

4.3 Pump and Treat Shutdown Criteria – Midco II

After about 6 to 12 months of operation of the SVE/AS system, it is expected that the HP/UV portion of the Midco II ground water treatment system will be unnecessary. The reason is that vinyl chloride, the only parameter requiring HP/UV treatment at the Midco II Site prior to discharge to the deep well, will be the first VOC to be removed by SVE/AS, given its high volatility and the aeration of the aquifer that would prevent the continuation of the current formation of vinyl chloride via anaerobic biodegradation of tetrachloroethene and trichloroethene.

The rest of the Midco II ground water pump and treat (the clarifier, if installed, and filters) system will be operated until:

- The ground water meets the CALs,
- A demonstration of technical impracticability is approved by the USEPA, or
- A ground water ordinance prohibiting the use of the ground water in the Gary Airport redevelopment zone is promulgated by the city of Gary and approved by the USEPA as an effective institutional control for the Site.

The Midco II Site is located within the area proposed for expansion of the Gary/Chicago Airport Development. In fact, the Gary/Chicago Airport Authority has already begun the process of acquiring lands adjacent to the Midco II site. The airport expansion plan also includes taking over the portion of Industrial Highway that runs in front of the airport, and its construction in a different location. As such, the ground water beneath the Midco II Site will not be used for drinking water purposes, and an ordinance established to prohibit the use of the ground water beneath the Gary Airport redevelopment zone will ensure that would be the case.

The MRC is discussing with the City of Gary, establishment of an ordinance in the Gary/Chicago Airport Development Zone to prohibit the use of ground water as a source of drinking water. The ordinance would create an institutional control that would eliminate a pathway for exposure that is the basis for the ground water CALs at Midco I and Midco II. The City of Chicago has a similar ordinance and will serve as a guide in our discussions with the City of Gary.

4.4 Miscellaneous Activities – Midco II

Sediment Area

As part of the proposed activities, the excavated sediment areas currently being held under an HDPE cover will be spread directly and beneath the sub-base of the site cover. Spreading of the sediments will be performed in a manner that minimizes volatile and fugitive dust emissions. Following spreading, compaction will be conducted to provide a suitable foundation for the site cap.

Monitoring Wells to be Used

Since no containment other than a cap will be used at the Midco II Site, the existing monitoring well network will be maintained and monitored. If the proposed modifications to the AWQC are accepted (as detailed in Appendix D), deletion of monitoring wells N-10 and P-10 from the sampling events would be accomplished. The rest of the monitoring wells at the Midco II Site will be sampled annually in

accordance with the approved modifications to the SOW requirements in terms of the parameters to be analyzed.

5.0 SUMMARY AND CONCLUSIONS

Remediation of the Midco I and Midco II sites have proceeded in accordance with the SOW established in 1992. The remedial activities identified in the SOW include:

- Site Security and Access Restrictions - Complete and Currently Being Maintained
- Close Out of Previous Investigations - Complete
- Excavation and On-Site Storage of Contaminated Sediments and Soils - Complete
- Ground Water Extraction and Treatment - Currently Being Operated and Maintained
- Deep Well Injection of Treated Ground Water - Currently Being Operated and Maintained
- Ground Water Monitoring During Operation of Treatment System - Underway
- Soil Treatment by SVE and in situ S/S of Soil Areas Defined by the Consent Decree/Statement of Work - Planned
- Final Site Cover after Soil Treatment - Planned
- Final Access Restrictions - Established
- Long Term Monitoring for 15 Years Following Completion of Remedial Actions - Planned
- Completion of Appropriate EPA Plans and Submittals - Underway

Performance of the above activities has resulted in the development of a substantial amount of data regarding impacts to the environmental media at both sites that did not exist when the remediation was defined in the SOW. These data, including more than 500 soil samples and 1,000 ground water samples, have provided a more comprehensive understanding of the conditions at both sites and the principal threat to the environment. In addition, the City of Gary and the Gary/Chicago Airport Authority have proposed potential future uses for both sites that differ from the situation than existed at the time the SOW was developed.

As described within this document, the MRC is proposing an alternate method for resolution of the remaining impacts at the Sites that will allow for future use of the Sites consistent with those anticipated by the City of Gary and the Gary/Chicago Airport Authority. The alternate eliminates in situ S/S of soil and greatly expands the SVE treatment previously envisioned. In addition, AS will be implemented at Midco II and a containment/barrier wall will be installed at Midco I. In consideration of the anticipated future uses of both sites, the MRC has proposed installation of a low permeability asphalt cap at Midco I and a soil cover at Midco II. This alternate will allow for resolution of a majority (approximately 90%) of the principal threat at the Sites.

The proposed alternate remedial activities substantially meet the remedial action objectives of the 1992 ROD Amendment while addressing principal threats at the Sites.

- The alternate remedial actions will provide protection of human health and the environment by extraction and treatment of the most mobile contaminants in the soil and ground water. The alternate remedial actions at Midco I site will augment soil and ground water treatment through containment with a barrier wall and covers that allow for future use of the sites consistent with surrounding properties. The remedial actions at Midco II will result in extraction and treatment of the most mobile soil contaminants in a fashion that will allow for future use of the site by the Gary/Chicago Airport Authority and continued operation of the ground water extraction and treatment system.

- The short-term effectiveness of the alternate remedial activities is consistent with the analysis of short-term effectiveness provided for in the 1992 ROD Amendment. The ground water pump, treatment and injection system has been installed and access to the Sites has been restricted. The components of the alternate remedy (cover, barrier wall, SVE/AS) provide a high level of short term effectiveness because they can be constructed in a short period of time with minimal risks.

- The ground water extraction and treatment system along with SVE, AS, and bioventing will reduce the toxicity, mobility, and volume of hazardous substances at both sites. SVE, AS, and bioventing will remedy the principal threat of the most mobile contaminants at the Sites. After extensive treatability studies, S/S was found to be much less effective in reducing the toxicity, mobility and volume of those hazardous substances representing the principal threat at both sites. Furthermore, in situ S/S is less available than existed at the time of the 1992 ROD Amendment.

- The alternate remedy incorporates extensive use of the preferred technology for resolution of VOC contamination, the principal threat at the Sites. The alternate remedy uses readily available construction techniques, equipment, and approaches, and can be easily and quickly implementable. In addition, the alternate remedy is implementable under the current site conditions and anticipated future use of the Sites.

In conclusion, the alternate remedy will substantially meet the requirements of the SOW thereby allowing for issuance of an ESD that provides for the minor changes to the remedy identified in the 1992 ROD Amendment and the SOW. The ESD would eliminate in situ S/S from the remedy since a binder could not be found that met the requirements established in the SOW. The ESD would identify more extensive use of SVE (with AS and bioventing) to resolve the principal threat at the Sites at a cost substantially less than the cost of implementing S/S for a similar volume of material. Furthermore the alternate remedy would allow for future use of the Sites consistent with anticipated plans of the City of Gary and the Gary/Chicago Airport Authority along with the USEPA's Superfund Redevelopment Initiative.

TABLES

TABLE 2-1

MODIFIED SITE-SPECIFIC AMBIENT WATER QUALITY CRITERIA AND CLEAN-UP ACTION LEVELS[1]
MIDCO I AND II SITES, GARY, INDIANA

	Background		*Project-Specific*		*AWQC*		*Original SOW AWQC x F*		*Modified AWQC x Frev* [2]		*Risk-Based*	*Risk-Based*	*SOW's Parameter-Specific CAL* [3]		*Modified Parameter-Specific CAL* [3]	
Parameter	*Midco I*	*Midco II*	*QL*	*MCL*	*Midco I*	*Midco II*	*Midco I*	*Midco II*	*Midco I*	*Midco II*	*Carc.*	*Noncarc.*	*Midco I*	*Midco II*	*Midco I*	*Midco II*
Antimony			1	6								12.9	6	6	6	6
Arsenic	6	15.1	2	10	48	48	187	173	276,877	342,871	0.18	32.4	10	15.1	10	15.1
Barium	118	107	20	2,000								1,620	1,620	1,620	1,620	1,620
Beryllium			1	4	5.3	5.3	20.7	19.1	30,649	37,855		162	4	4	4	4
Cadmium		0.15	1	5	1.2	2.9	4.68	10.4	6,929	20,612		32.4	4.68	5	5	5
Chromium (III) [4]	8	7.5	1	100	220	558	858	2,010	1,270,376	3,983,649		32,400	100	100	100	100
Copper		25.2	1		13	33	50.7	120	75,068	237,830			50.7	120	75,100	237,800
Iron	3,880	15,300	50		1,000	1,000	3,900	3,600	5,774,436	7,134,894			3,900	15,300	5,770,000	7,130,000
Lead		5.6	1		3.5	15	13.7	53.6	20,285	106,231			13.7	53.6	20,300	106,200
Manganese	1,400	464	25									6,470	6,470	6,470	6,470	6,470
Mercury		0.25	0.2	2	0.012	0.012	0.0468	0.0432	69	86		9.71	0.20	0.25	2	2
Nickel	58	12.3	7		168	439	655	1,580	969,809	3,131,426		647	647	647	647	647
Selenium			2	50	35	35	137	126	202,846	249,721		97.1	50	50	50	50
Silver		4.6	1		0.12	0.12	0.468	0.432	693	856			1	4.6	693	856
Thallium			3	2	40	40	156	144	230,977	285,396		2.27	3	3	3	3
Vanadium	4.33		1									227	227	227	227	227
Zinc		1,470	1		341	878	1,330	3,160	1,969,231	6,262,851		6,470	1,330	3,160	6,470	6,470
Cyanide	10.4	158	10	200	5.2	5.2	20.3	18.7	30,057	37,062		647	20.3	158	200	200
Chromium (VI) [4]	8	7.5	10	100	11	11	42.9	39.6	63,519	78,484		162	42.9	39.6	100	100

Key:

AWQC x F = Site-specific chronic ambient water quality criteria (AWQC), equal to the federal chronic AWQC for protection of aquatic life times the site-specific factor F; from Table 2 of Attachment 2 of the Midco I and II Statement of Work, dated June 1992

Background = Site-specific background ground water concentrations; from Table 1 of Attachment 2 of the Midco I and II Statement of Work, dated June 1992

Blank = No value available or not applicable

CAL = Clean-up Action Level

Carc. = Carcinogenic risk-based concentration equivalent to 1E-05 carcinogenic risk for the individual parameter

Frev = Revised site-specific factor

MCL = Primary maximum contaminant level, from 40 CFR 141, as of May 2002

Noncarc. = Noncarcinogenic risk-based concentration equivalent to 1 noncarcinogenic hazard index for the individual parameter

QL = Quantitation Limit

= Modified based on revised site-specific AWQC

[1] All concentrations are given in micrograms per liter.

[2] The data and equations used to calculate Frev is summarized in Table 10-2.

[3] Lowest value between the MCL, AWQC, and the risk-based concentrations calculated as if the parameter was the only parameter detected in the sample, but not less than the project-specific detection limit or the site-specific background concentrations. The risk-based concentrations were calculated by following the procedures in Attachment 2 of the Midco I and Midco II Statement of Work, dated June 1992.

[4] The maximum contaminant level applies to both chromium species.

TABLE 2-2
SUMMARY OF PERCENT RELATIVE RISK REDUCTION BY FRACTION
USING ALL CELLS AND PARAMETERS - INITIAL USEPA PROPOSAL
MIDCO I AND MIDCO II, GARY, INDIANA
(PAGE 1 OF 8)

Sample	Volume	VOCs		SVOCs		PCBs		CN		Metals		Total
Name	cy	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	%RRED
1ST0A51	267	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	6.49	0.02%	0.02%
1ST0A54	267	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST0B51	400	1.09	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	3.88	0.02%	0.02%
1ST0B54	400	19.94	0.08%	1.00	0.00%	0.00	0.00%	0.00	0.00%	3.75	0.02%	0.10%
1ST0C51	400	40.09	0.16%	1.00	0.00%	0.00	0.00%	1.56	0.01%	11.31	0.05%	0.22%
1ST0C54	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	8.30	0.03%	151.93	0.62%	0.66%
1ST0D51	400	22.86	0.09%	12.60	0.05%	0.00	0.00%	178.00	0.73%	28.87	0.12%	0.99%
1ST0D54	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	183.81	0.75%	0.76%
1ST0E21	200	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	42.89	0.09%	0.09%
1ST0E24	200	0.00	0.00%	1.00	0.00%	0.00	0.00%	2.79	0.01%	9.20	0.02%	0.03%
1ST0E71	100	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	5.90	0.01%	0.01%
1ST0E74	100	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	45.63	0.05%	0.05%
1ST0E91	100	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	3.04	0.00%	0.00%
1ST0E94	100	15.48	0.02%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.02%
1ST0F11	60	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	13.51	0.01%	0.01%
1ST0F14	60	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST0F31	60	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	3.51	0.00%	0.00%
1ST0F34	60	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	2.07	0.00%	0.00%
1ST0F51	280	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST0F54	280	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST0G51	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST0G54	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST0H51	333	24.36	0.08%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.09%
1ST0H54	333	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST1A51	267	189.14	0.52%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.52%
1ST1A54	267	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	1.09	0.00%	0.01%
1ST1B51	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	43.13	0.18%	0.18%
1ST1B54	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	3.31	0.01%	0.02%
1ST1C51	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	5.35	0.02%	4.09	0.02%	0.04%
1ST1C54	400	28.41	0.12%	1.00	0.00%	0.00	0.00%	1.58	0.01%	32.03	0.13%	0.26%
1ST1D51	400	29.18	0.12%	1.00	0.00%	0.00	0.00%	5.80	0.02%	2.23	0.01%	0.16%
1ST1D54	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	33.42	0.14%	0.14%
1ST1E51	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	25.53	0.10%	0.11%
1ST1E54	400	7.45	0.03%	1.00	0.00%	0.00	0.00%	0.00	0.00%	12.51	0.05%	0.09%
1ST1F51	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	11.88	0.05%	0.05%
1ST1F54	400	132.78	0.54%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.55%
1ST1G51	400	28.27	0.12%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.12%
1ST1G54	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST1H51	333	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST1H54	333	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST2A51	267	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	1.59	0.00%	0.01%
1ST2A54	267	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	2.87	0.01%	0.01%
1ST2B51	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	2.23	0.01%	0.01%
1ST2B54	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST2C51	400	1.82	0.01%	1.00	0.00%	0.00	0.00%	0.00	0.00%	40.10	0.16%	0.18%
1ST2C54	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	27.54	0.11%	0.12%
1ST2D51	330	2.65	0.01%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
1ST2D54	330	43.40	0.15%	4.05	0.01%	0.00	0.00%	12.45	0.04%	130.70	0.44%	0.64%
1ST2D91T	70	0.00	0.00%	2.05	0.00%	0.00	0.00%	0.00	0.00%	1.38	0.00%	0.00%
1ST2D94T	70	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	4.55	0.00%	0.00%
1ST2E31T	45	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST2E34T	45	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST2E51	355	12.27	0.04%	1.00	0.00%	0.00	0.00%	0.00	0.00%	39.74	0.14%	0.19%
1ST2E54	355	270.22	0.98%	2.35	0.01%	0.00	0.00%	0.00	0.00%	4.25	0.02%	1.01%
1ST2F51	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	335.67	1.38%	1.38%
1ST2F54	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	18.48	0.08%	0.08%
1ST2G51	400	77.36	0.32%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.32%
1ST2G54	400	0.00	0.00%	3.85	0.02%	0.00	0.00%	0.00	0.00%	7.99	0.03%	0.05%
1ST2H51	333	0.00	0.00%	1.00	0.00%	0.00	0.00%	9.60	0.03%	1.19	0.00%	0.04%
1ST2H54	333	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST3A51	267	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST3A54	267	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	6.36	0.02%	0.02%
1ST3B51	400	9.90	0.04%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.04%
1ST3B54	400	8.55	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.04%
1ST3C51	250	9.85	0.03%	1.00	0.00%	0.00	0.00%	0.00	0.00%	17.78	0.05%	0.07%
1ST3C54	250	3.75	0.01%	102.79	0.26%	0.00	0.00%	0.00	0.00%	177.61	0.45%	0.73%
1ST3C91	150	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	8.86	0.01%	0.02%
1ST3C94	150	0.00	0.00%	2.25	0.00%	0.00	0.00%	3.14	0.00%	2.47	0.00%	0.01%
1ST3D11	100	21.44	0.02%	1.00	0.00%	0.00	0.00%	2.17	0.00%	0.00	0.00%	0.03%
1ST3D14	100	2,442.21	2.50%	4.21	0.00%	0.00	0.00%	0.00	0.00%	5.63	0.01%	2.51%

TABLE 2-2
SUMMARY OF PERCENT RELATIVE RISK REDUCTION BY FRACTION
USING ALL CELLS AND PARAMETERS - INITIAL USEPA PROPOSAL
MIDCO I AND MIDCO II, GARY, INDIANA
(PAGE 2 OF 8)

Sample	Volume	VOCs		SVOCs		PCBs		CN		Metals		Total
Name	cy	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	%RRED
1ST3D31	100	115.13	0.12%	1.00	0.00%	0.00	0.00%	8.55	0.01%	1.05	0.00%	0.13%
1ST3D34	100	1.41	0.00%	3.18	0.00%	0.00	0.00%	0.00	0.00%	52.52	0.05%	0.06%
1ST3D71	100	22.14	0.02%	16.50	0.02%	0.00	0.00%	0.00	0.00%	7.40	0.01%	0.05%
1ST3D74	100	0.00	0.00%	2.35	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST3D91	100	0.00	0.00%	5.33	0.01%	0.00	0.00%	19.85	0.02%	12.82	0.01%	0.04%
1ST3D94	100	0.00	0.00%	15.80	0.02%	0.00	0.00%	0.00	0.00%	1.10	0.00%	0.02%
1ST3E11	135	170.51	0.24%	28.50	0.04%	0.00	0.00%	0.00	0.00%	2.20	0.00%	0.28%
1ST3E14	135	0.00	0.00%	12.28	0.02%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.02%
1ST3E31	135	177.55	0.25%	45.03	0.06%	0.00	0.00%	10.90	0.02%	28.74	0.04%	0.36%
1ST3E34	135	0.00	0.00%	3.10	0.00%	0.00	0.00%	0.00	0.00%	1.36	0.00%	0.01%
1ST3E71	65	40.04	0.03%	1.00	0.00%	0.00	0.00%	1.37	0.00%	0.00	0.00%	0.03%
1ST3E74	65	6.31	0.00%	1.00	0.00%	0.00	0.00%	1.14	0.00%	0.00	0.00%	0.01%
1ST3E91	65	701.13	0.47%	81.71	0.05%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.52%
1ST3E94	65	3,013.53	2.01%	52.08	0.03%	0.00	0.00%	5.25	0.00%	11.55	0.01%	2.05%
1ST3F51	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	30.82	0.13%	0.13%
1ST3F54	400	33.15	0.14%	1.00	0.00%	0.00	0.00%	0.00	0.00%	14.26	0.06%	0.20%
1ST3G51	400	5,254.05	21.53%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	21.53%
1ST3G54	400	35.55	0.15%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.15%
1ST3H51	333	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST3H54	333	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST4A51	267	22.64	0.06%	1.00	0.00%	0.00	0.00%	0.00	0.00%	1.01	0.00%	0.07%
1ST4A54	267	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST4B51	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST4B54	400	14.08	0.06%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.06%
1ST4C51	230	0.00	0.00%	1.40	0.00%	0.00	0.00%	45.80	0.11%	16.46	0.04%	0.15%
1ST4C54	230	3.90	0.01%	0.00	0.00%	0.00	0.00%	2.92	0.01%	5.52	0.01%	0.03%
1ST4C71	170	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	1.83	0.00%	0.00%
1ST4C74	170	1.00	0.00%	2.35	0.00%	0.00	0.00%	0.00	0.00%	16.28	0.03%	0.03%
1ST4D11	130	71.00	0.09%	4.75	0.01%	0.00	0.00%	48.25	0.06%	8.88	0.01%	0.18%
1ST4D14	130	5.30	0.01%	24.10	0.03%	0.00	0.00%	0.00	0.00%	164.31	0.22%	0.26%
1ST4D61	130	10.85	0.01%	5.45	0.01%	0.00	0.00%	60.00	0.08%	22.74	0.03%	0.13%
1ST4D71	140	376.24	0.54%	6.55	0.01%	0.00	0.00%	50.50	0.07%	26.71	0.04%	0.66%
1ST4D74	140	12.50	0.02%	1.00	0.00%	0.00	0.00%	1.07	0.00%	1.16	0.00%	0.02%
1ST4E11	110	380.29	0.43%	9.50	0.01%	0.00	0.00%	3.76	0.00%	0.00	0.00%	0.44%
1ST4E14	110	704.84	0.79%	14.20	0.02%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.81%
1ST4E51	290	1,125.44	3.34%	38.00	0.11%	0.00	0.00%	1.63	0.00%	2.91	0.01%	3.47%
1ST4E54	290	6,805.82	20.22%	43.44	0.13%	0.00	0.00%	0.00	0.00%	1.88	0.01%	20.35%
1ST4F51	400	14.53	0.06%	1.00	0.00%	0.00	0.00%	0.00	0.00%	79.46	0.33%	0.39%
1ST4F54	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	20.84	0.09%	0.09%
1ST4G51	400	52.84	0.22%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.22%
1ST4G54	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST4H51	333	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST4H54	333	0.00	0.00%	2.40	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
1ST5A71	150	3.60	0.01%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
1ST5A74	150	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	2.38	0.00%	0.01%
1ST5B51	350	32.87	0.12%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.12%
1ST5B54	350	8.45	0.03%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.03%
1ST5C51	400	10.15	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.04%
1ST5C54	400	22.70	0.09%	0.00	0.00%	0.00	0.00%	5.10	0.02%	0.00	0.00%	0.11%
1ST5D51	400	0.00	0.00%	1.00	0.00%	0.00	0.00%	4.65	0.02%	0.00	0.00%	0.02%
1ST5E51	320	62.58	0.21%	5.50	0.02%	0.00	0.00%	0.00	0.00%	1.03	0.00%	0.23%
1ST5E54	320	164.42	0.54%	51.09	0.17%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.71%
1ST5E91	80	484.33	0.40%	4.20	0.00%	0.00	0.00%	0.00	0.00%	2.12	0.00%	0.40%
1ST5E94	80	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	2.36	0.00%	0.00%
1ST5F11	80	8.75	0.01%	4.25	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
1ST5F14	80	0.00	0.00%	7.00	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
1ST5F31	120	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	20.16	0.02%	0.03%
1ST5F34	120	146.87	0.18%	1.00	0.00%	0.00	0.00%	1.12	0.00%	0.00	0.00%	0.18%
1ST5F71	70	48.20	0.03%	3.83	0.00%	0.00	0.00%	6.80	0.00%	1.32	0.00%	0.04%
1ST5F74	70	8.00	0.01%	3.05	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
1ST5F91	130	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	82.00	0.11%	0.11%
1ST5F94	130	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST5G11	75	62.90	0.05%	3.50	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.05%
1ST5G14	75	0.00	0.00%	23.00	0.02%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.02%
1ST5G31	125	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST5G34	125	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST5G71	80	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST5G74	80	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST5G91	120	5.70	0.01%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
1ST5G94	120	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%

TABLE 2-2
SUMMARY OF PERCENT RELATIVE RISK REDUCTION BY FRACTION
USING ALL CELLS AND PARAMETERS - INITIAL USEPA PROPOSAL
MIDCO I AND MIDCO II, GARY, INDIANA
(PAGE 3 OF 8)

Sample	Volume	VOCs		SVOCs		PCBs		CN		Metals		Total
Name	cy	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	%RRED
1ST5H41	333	126.64	0.43%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.44%
1ST5H44	333	0.00	0.00%	1.00	0.00%	0.00		0.00		0.00		
1ST6C41	90	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST6C44	90	1.09	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST6D51	170	24.95	0.04%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.05%
1ST6D54	170	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST6E51	135	0.00	0.00%	1.00	0.00%	1.52	0.00%	0.00	0.00%	4.00	0.01%	0.01%
1ST6E54	135	7.63	0.01%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
1ST6E71	65	12.65	0.01%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
1ST6E74	65	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST6F11	100	3.75	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	4.07	0.00%	0.01%
1ST6F14	100	142.70	0.15%	14.00	0.01%	1.00	0.00%	0.00	0.00%	2.39	0.00%	0.16%
1ST6F71	100	31.25	0.03%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.03%
1ST6F74	100	53.25	0.05%	1.00	0.00%	0.00	0.00%	0.00	0.00%	2.02	0.00%	0.06%
1ST6G11	100	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST6G14	100	257.55	0.26%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.26%
1ST6G71	100	2.40	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST6G74	100	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST6H51	170	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
1ST6H54	170	0.00	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0B51	453	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0B54	453	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.35	0.01%	0.01%
2ST0B91	0	0.00	0.00%	******	0.00%	******	0.00%	******	0.00%	0.00	0.00%	0.00%
2ST0C51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0C54	533	6.90	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.04%
2ST0D11	106	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0D14	106	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	5.85	0.01%	0.01%
2ST0D31	140	1.05	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0D34	140	27.00	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.18	0.00%	0.04%
2ST0D71	222	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0D74	222	2.70	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST0D91	80	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.52	0.00%	0.00%
2ST0D94	80	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.98	0.00%	0.00	0.00%	0.00%
2ST0E51	518	18.00	0.10%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.41	0.01%	0.11%
2ST0E54	518	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0F11	80	28.00	0.02%	0.00	0.00%	0.00	0.00%	0.00	0.00%	4.06	0.00%	0.03%
2ST0F14	80	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0F31	116	6.25	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST0F34	116	11.00	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST0F71	186	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0F74	186	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.18	0.00%	0.00%
2ST0F91	150	0.00	0.00%	1.95	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0F94	150	17.60	0.03%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.17	0.00%	0.03%
2ST0G11	133	19.80	0.03%	0.00	0.00%	0.00	0.00%	0.00	0.00%	4.10	0.01%	0.03%
2ST0G14	133	23.50	0.03%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.03%
2ST0G31	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0G34	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.31	0.00%	0.00%
2ST0G71	150	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.59	0.00%	0.00%
2ST0G74	150	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0G91	160	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0G94	160	1.55	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.77	0.00%	0.01%
2ST0H31	106	1.25	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0H34	106	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0H51	116	1.10	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0H54	116	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0I51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0I54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0J51	533	19.00	0.10%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.10%
2ST0J54	533	29.00	0.16%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.16%
2ST0K51	533	41.00	0.22%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.42	0.02%	0.24%
2ST0K54	533	4.40	0.02%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.08	0.02%	0.04%
2ST0L51	533	13.10	0.07%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.51	0.02%	0.09%
2ST0L54	533	34.00	0.19%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.19%
2ST0M51	533	4.60	0.03%	0.00	0.00%	0.00	0.00%	0.00	0.00%	6.42	0.04%	0.06%
2ST0M54	533	15.00	0.08%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.08%
2ST0N51	533	1.40	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.53	0.01%	0.02%
2ST0N54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.54	0.01%	0.01%
2ST0O51	533	22.10	0.12%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.12%
2ST0O54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0P51	533	3.50	0.02%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.02%

TABLE 2-2
SUMMARY OF PERCENT RELATIVE RISK REDUCTION BY FRACTION
USING ALL CELLS AND PARAMETERS - INITIAL USEPA PROPOSAL
MIDCO I AND MIDCO II, GARY, INDIANA
(PAGE 4 OF 8)

Sample	Volume	VOCs		SVOCs		PCBs		CN		Metals		Total
Name	cy	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	%RRED
2ST0P54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST0Q51	533	1.00	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST0Q54	533	1.90	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST0R51	533	126.60	0.69%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.69%
2ST0R54	533	58.40	0.32%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.32%
2ST1B71	479	28.10	0.14%	0.00	0.00%	0.00	0.00%	0.00	0.00%	8.57	0.04%	0.18%
2ST1B74	479	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST1B91	133	******	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.62	0.00%	0.00%
2ST1B94	133	19.00	0.03%	0.00	0.00%	0.00	0.00%	0.00	0.00%	8.64	0.01%	0.04%
2ST1C51	533	1.20	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.36	0.01%	0.01%
2ST1C54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST1D51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST1D54	533	4.00	0.02%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.75	0.01%	0.03%
2ST1E51	533	22.00	0.12%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.12%
2ST1E54	533	1.60	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST1F51	266	0.00	0.00%	0.00	0.00%	3.40	0.01%	0.00	0.00%	0.00	0.00%	0.01%
2ST1F54	266	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	5.58	0.02%	0.02%
2ST1F71	120	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.14	0.00%	0.00%
2ST1F74	120	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST1F91	146	1.10	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST1F94	146	1.90	0.00%	1.00	0.00%	0.00	0.00%	0.00	0.00%	3.10	0.00%	0.01%
2ST1G11	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST1G14	133	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST1G31	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST1G34	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.91	0.00%	0.00%
2ST1G71	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST1G74	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.45	0.00%	0.00%
2ST1G91	133	6.00	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST1G94	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.25	0.00%	0.00%
2ST1H31	150	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST1H34	150	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST1H51	383	36.00	0.14%	2.00	0.01%	0.00	0.00%	0.00	0.00%	2.57	0.01%	0.16%
2ST1H54	383	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.23	0.00%	0.00%
2ST1I51	533	26.00	0.14%	142.50	0.78%	0.00	0.00%	0.00	0.00%	2.11	0.01%	0.93%
2ST1I54	533	598.54	3.27%	27.30	0.15%	0.00	0.00%	0.00	0.00%	1.51	0.01%	3.42%
2ST1J51	533	3.15	0.02%	8.75	0.05%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.06%
2ST1J54	533	2.10	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.51	0.02%	0.03%
2ST1K51	533	2.40	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.11	0.01%	0.02%
2ST1K54	533	1.95	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST1L51	533	1.70	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST1L54	533	5.95	0.03%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.03%
2ST1M51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	4.47	0.02%	0.02%
2ST1M54	533	4.20	0.02%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.02%
2ST1N51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST1N54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST1O51	533	6.50	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.04%
2ST1O54	533	150.00	0.82%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.82%
2ST1P51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.27	0.01%	0.01%
2ST1P54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.45	0.02%	0.02%
2ST1Q51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST1Q54	533	7.00	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.04%
2ST1R51	525	71.00	0.38%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.38%
2ST1R54	525	5.70	0.03%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.03%
2ST2B51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST2B54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.43	0.02%	0.02%
2ST2C71	210	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.02	0.01%	0.01%
2ST2C74	210	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST2C91	323	9.50	0.03%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.03%
2ST2C94	323	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	4.49	0.01%	0.01%
2ST2D51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST2D54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST2E51	490	1.10	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST2E54	490	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST2E91	75	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST2E94	75	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.32	0.00%	0.00%
2ST2F11	111	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST2F14	111	0.00	0.00%	1.80	0.00%	0.00	0.00%	1.94	0.00%	5.70	0.01%	0.01%
2ST2F31	133	9.00	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST2F34	133	1.35	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST2F71	133	0.00	0.00%	4.30	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%

TABLE 2-2
SUMMARY OF PERCENT RELATIVE RISK REDUCTION BY FRACTION
USING ALL CELLS AND PARAMETERS - INITIAL USEPA PROPOSAL
MIDCO I AND MIDCO II, GARY, INDIANA
(PAGE 5 OF 8)

Sample	Volume	VOCs		SVOCs		PCBs		CN		Metals		Total
Name	cy	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	%RRED
2ST2F74	133	0.00	0.00%	2.30	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST2F91	133	7.50	0.01%	2.00	0.00%	0.00	0.00%	0.00	0.00%	20.03	0.03%	0.04%
2ST2F94	133	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST2G11	133	1.23	0.00%	1.30	0.00%	0.00	0.00%	0.00	0.00%	3.84	0.01%	0.01%
2ST2G14	133	7.50	0.01%	8.00	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.02%
2ST2G31	133	52.43	0.07%	4.50	0.01%	0.00	0.00%	2.13	0.00%	0.00	0.00%	0.08%
2ST2G34	133	52.07	0.07%	1.90	0.00%	0.00	0.00%	1.14	0.00%	0.00	0.00%	0.08%
2ST2G71	133	1.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	4.88	0.01%	0.01%
2ST2G91	133	1.70	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	83.82	0.11%	0.12%
2ST2G94	133	0.00	0.00%	2.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST2H11	120	1.35	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST2H14	120	1.40	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	8.72	0.01%	0.01%
2ST2H31	123	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST2H34	123	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.07	0.00%	0.00%
2ST2H51	290	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.79	0.01%	0.01%
2ST2H54	290	7.00	0.02%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.02%
2ST2I11	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.33	0.00%	1.24	0.00%	0.00%
2ST2I14	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.21	0.00%	0.00%
2ST2I31	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	11.02	0.02%	0.02%
2ST2I34	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.17	0.00%	0.00%
2ST2I71	133	0.00	0.00%	3.15	0.00%	0.00	0.00%	0.00	0.00%	1.11	0.00%	0.01%
2ST2I74	133	3.10	0.00%	2.25	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST2I91	133	10.50	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	4.70	0.01%	0.02%
2ST2I94	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.24	0.00%	0.00%
2ST2J51	533	30.00	0.16%	1.20	0.01%	0.00	0.00%	0.00	0.00%	3.87	0.02%	0.19%
2ST2J54	533	185.98	1.02%	3.55	0.02%	0.00	0.00%	0.00	0.00%	1.93	0.01%	1.05%
2ST2K51	533	7.70	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.04%
2ST2K54	533	1.60	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.27	0.02%	0.03%
2ST2L51	533	26.60	0.15%	5.25	0.03%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.17%
2ST2L54	533	257.40	1.41%	1.90	0.01%	0.00	0.00%	0.00	0.00%	9.42	0.05%	1.47%
2ST2M51	533	14.50	0.08%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.08%
2ST2M54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST2N51	533	2.10	0.01%	0.00	0.00%	0.00	0.00%	1.72	0.01%	0.00	0.00%	0.02%
2ST2N54	533	8.10	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.04%
2ST2O51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.22	0.01%	0.01%
2ST2O54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.57	0.01%	0.01%
2ST2P51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST2P54	533	2.20	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	12.20	0.07%	0.08%
2ST2Q51	533	1.80	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST2Q54	533	8.30	0.05%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.34	0.01%	0.06%
2ST2R51	520	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST2R54	520	1.20	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST3B51	533	0.00	0.00%	0.00	0.00%	1.80	0.01%	0.00	0.00%	0.00	0.00%	0.01%
2ST3B54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST3C71	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST3C74	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.09	0.01%	0.01%
2ST3D51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.09	0.01%	0.01%
2ST3D54	533	0.00	0.00%	3.05	0.02%	0.00	0.00%	0.00	0.00%	1.83	0.01%	0.03%
2ST3E11	380	6.00	0.02%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.02%
2ST3E14	380	0.00	0.00%	2.90	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST3E71	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST3E74	133	0.00	0.00%	2.45	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST3E91	20	7.90	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST3E94	20	386.16	0.08%	17.60	0.00%	0.00	0.00%	62.00	0.01%	139.36	0.03%	0.12%
2ST3F11	133	1.70	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.07	0.00%	0.01%
2ST3F14	133	5.55	0.01%	6.00	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.02%
2ST3F31	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.26	0.00%	4.43	0.01%	0.01%
2ST3F34	133	12.25	0.02%	4.20	0.01%	0.00	0.00%	0.00	0.00%	1.06	0.00%	0.02%
2ST3F71	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	5.65	0.01%	0.01%
2ST3F74	133	36.50	0.05%	10.50	0.01%	0.00	0.00%	0.00	0.00%	11.13	0.02%	0.08%
2ST3F91	133	3.20	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST3F94	133	13.15	0.02%	5.00	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.02%
2ST3G11	133	32.00	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.04%
2ST3G14	133	162.84	0.22%	1.50	0.00%	0.00	0.00%	8.00	0.01%	1.84	0.00%	0.24%
2ST3G31	133	7.00	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST3G34	133	76.07	0.10%	6.50	0.01%	0.00	0.00%	4.90	0.01%	0.00	0.00%	0.12%
2ST3G71	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST3G74	133	1.60	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.90	0.00%	0.01%
2ST3G91	133	0.00	0.00%	7.00	0.01%	0.00	0.00%	0.00	0.00%	5.46	0.01%	0.02%
2ST3G94	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.03	0.00%	0.00%

TABLE 2-2
SUMMARY OF PERCENT RELATIVE RISK REDUCTION BY FRACTION
USING ALL CELLS AND PARAMETERS - INITIAL USEPA PROPOSAL
MIDCO I AND MIDCO II, GARY, INDIANA
(PAGE 6 OF 8)

Sample	Volume	VOCs		SVOCs		PCBs		CN		Metals		Total
Name	cy	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	%RRED
2ST3H11	133	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST3H14	133	546.99	0.75%	6.50	0.01%	0.00	0.00%	0.00	0.00%	1.04	0.00%	0.76%
2ST3H31	133	4.10	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	4.02	0.01%	0.01%
2ST3H34	133	0.00	0.00%	11.00	0.01%	0.00	0.00%	0.00	0.00%	2.01	0.00%	0.02%
2ST3H71	133	1.15	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST3H74	133	1.90	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST3H91	133	28.50	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%	53.66	0.07%	0.11%
2ST3H94	133	26.50	0.04%	2.95	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.04%
2ST3I51	533	1.60	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.28	0.02%	0.03%
2ST3I54	533	8.60	0.05%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.05%
2ST3J51	533	2.10	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST3J54	533	57.00	0.31%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.37	0.01%	0.32%
2ST3K51	533	2.50	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST3K54	533	2.00	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	5.37	0.03%	0.04%
2ST3L51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST3L54	533	321.60	1.76%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.76%
2ST3M51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST3M54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST3N51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST3N54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST3O51	533	1.00	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.56	0.02%	0.02%
2ST3O54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.62	0.01%	0.00	0.00%	0.01%
2ST3P51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST3P54	533	5.50	0.03%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.03%
2ST3Q51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST3Q54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST3R51	510	15.60	0.08%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.08%
2ST3R54	510	780.00	4.07%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	4.07%
2ST4B51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	10.24	0.06%	0.06%
2ST4B54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST4C51	533	4.30	0.02%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.74	0.01%	0.04%
2ST4C54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.39	0.01%	0.01%
2ST4D51	533	2.70	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST4D54	533	7.30	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.04%
2ST4E51	250	39.00	0.10%	0.00	0.00%	0.00	0.00%	20.35	0.05%	69.04	0.18%	0.33%
2ST4E54	250	4.00	0.01%	0.00	0.00%	0.00	0.00%	8.00	0.02%	6.76	0.02%	0.05%
2ST4F51	200	0.00	0.00%	0.00	0.00%	0.00	0.00%	500.00	1.02%	2.62	0.01%	1.03%
2ST4F54	200	2.40	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST4G51	250	4.40	0.01%	0.00	0.00%	0.00	0.00%	500.00	1.28%	0.00	0.00%	1.29%
2ST4G54	250	5.50	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.69	0.01%	0.02%
2ST4H51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.35	0.02%	0.02%
2ST4H54	533	76.93	0.42%	9.00	0.05%	0.00	0.00%	6.75	0.04%	5.19	0.03%	0.53%
2ST4I51	533	265.70	1.45%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.45%
2ST4I54	533	9.00	0.05%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.05%
2ST4J51	533	5.20	0.03%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.05	0.02%	0.05%
2ST4J54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST4K51	533	66.50	0.36%	0.00	0.00%	0.00	0.00%	0.00	0.00%	5.20	0.03%	0.39%
2ST4K54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.50	0.02%	0.02%
2ST4L51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST4L54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.04	0.01%	0.01%
2ST4M51	533	1.80	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST4M54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST4N51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST4N54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST4O51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.33	0.02%	0.02%
2ST4O54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST4P51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST4P54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST4Q51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST4Q54	533	1.00	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST4R51	500	5.50	0.03%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.03%
2ST4R54	500	24.50	0.13%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.13%
2ST5B51	533	9.00	0.05%	0.00	0.00%	1.20	0.01%	0.00	0.00%	0.00	0.00%	0.06%
2ST5B54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	19.60	0.11%	0.11%
2ST5C51	533	7.00	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%	9.00	0.05%	0.09%
2ST5C54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST5D51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	4.09	0.02%	0.02%
2ST5D54	533	2.90	0.02%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.02%
2ST5E51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST5E54	533	1.25	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%

TABLE 2-2
SUMMARY OF PERCENT RELATIVE RISK REDUCTION BY FRACTION
USING ALL CELLS AND PARAMETERS - INITIAL USEPA PROPOSAL
MIDCO I AND MIDCO II, GARY, INDIANA
(PAGE 7 OF 8)

Sample	Volume	VOCs		SVOCs		PCBs		CN		Metals		Total
Name	cy	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	Total MPS	%RRED	%RRED
2ST5F51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST5F54	533	3.50	0.02%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.02%
2ST5G51	533	8.00	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.35	0.01%	0.05%
2ST5G54	533	540.11	2.95%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.95%
2ST5H51	210	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.44	0.01%	0.01%
2ST5H54	210	27.00	0.06%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.06%
2ST5I51	200	5.70	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST5I54	200	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.13	0.00%	0.00%
2ST5J51	200	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.19	0.00%	0.00%
2ST5J54	200	5.00	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	12.47	0.03%	0.04%
2ST5K51	200	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.49	0.01%	0.01%
2ST5K54	200	1.10	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST5L51	200	1.70	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.41	0.00%	0.01%
2ST5L54	200	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	4.35	0.01%	0.01%
2ST5M51	200	2.40	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST5M54	200	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST5N51	200	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST5N54	200	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.60	0.01%	0.01%
2ST5O51	200	2.10	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST5O54	200	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST5P51	200	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST5P54	200	6.00	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST5Q51	200	1.60	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST5Q54	200	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST5R51	180	1.30	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST5R54	180	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST6B51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST6B54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST6C51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST6C54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.22	0.01%	0.01%
2ST6D51	533	20.20	0.11%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.11%
2ST6D54	533	2.70	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.02	0.01%	0.02%
2ST6E51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST6E54	533	1.15	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.05	0.01%	0.01%
2ST6F51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	20.13	0.11%	0.11%
2ST6F54	533	1.35	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.43	0.01%	0.02%
2ST6G51	545	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.37	0.01%	0.01%
2ST6G54	545	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST7B51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST7B54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST7C51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST7C54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.07	0.01%	0.01%
2ST7D51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST7D54	533	2.40	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST7E51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST7E54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST7F51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST7F54	533	14.00	0.08%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.08%
2ST7G51	545	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.87	0.02%	0.02%
2ST7G54	545	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.40	0.01%	0.00	0.00%	0.01%
2ST8B51	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	7.20	0.04%	0.04%
2ST8B54	533	1.00	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST8C51	533	5.00	0.03%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.03%
2ST8C54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.56	0.02%	0.02%
2ST8D51	533	0.00	0.00%	1.15	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST8D54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST8E51	533	0.00	0.00%	1.30	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST8E54	533	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.16	0.01%	0.01%
2ST8F51	533	1.60	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST8F54	533	1.50	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.01%
2ST8G51	545	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST8G54	545	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST9B41	180	50.05	0.09%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.93	0.01%	0.10%
2ST9B44	180	32.21	0.06%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.06%
2ST9C41	180	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.64	0.00%	0.00%
2ST9C44	180	12.00	0.02%	0.00	0.00%	0.00	0.00%	0.00	0.00%	5.52	0.01%	0.03%
2ST9D41	180	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.60	0.00%	0.00%
2ST9D44	180	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.95	0.00%	0.00%
2ST9E41	180	17.00	0.03%	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.95	0.01%	0.04%
2ST9E44	180	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	1.47	0.00%	0.00%

TABLE 2-2
SUMMARY OF PERCENT RELATIVE RISK REDUCTION BY FRACTION
USING ALL CELLS AND PARAMETERS - INITIAL USEPA PROPOSAL
MIDCO I AND MIDCO II, GARY, INDIANA
(PAGE 8 OF 8)

Sample Name	Volume cy	VOCs Total MPS	VOCs %RRED	SVOCs Total MPS	SVOCs %RRED	PCBs Total MPS	PCBs %RRED	CN Total MPS	CN %RRED	Metals Total MPS	Metals %RRED	Total %RRED
2ST9F41	180	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST9F44	180	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00%
2ST9G41	185	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.32	0.00%	0.00%
2ST9G44	185	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	9.84	0.02%	0.02%
Calculations												
Total			84.64%		2.77%		0.03%		3.83%		8.74%	100.00%
Total RELR, all fractions												9,762,950
Midco I risk addressed (all site)			59.54%		1.49%		0.00%		1.35%		6.67%	69.05%
Midco II risk (shaded cells only)			19.86%		1.20%							21.06%
Total risk addressed			79.39%		2.69%		0.00%		1.35%		6.67%	90.11%
Total risk remaining			5.25%		0.07%		0.03%		2.48%		2.06%	9.89%

% Organics risk addressed: 93.88%

% CN and Metals risk addressed: 63.83%

Volume addressed (Midco I) or treated (Midco II) based on a depth of 8 fee Volume addressed (Midco I) or treated (Midco II) based on a depth of 8 feet

Midco I vol	37,196 cubic yards (all site)	46,495 cubic yards (all site)
Midco II vol	52,501 cubic yards	65,626 cubic yards
Total vol	89,697 cubic yards	112,121 cubic yards

Key:

CN = Cyanide	%RRED = Percent relative risk reduced
MPS = Minimum performance standard	SVOCs = Semivolatile organic compounds
PCBs = Polychlorinated biphenyls	VOCs = Volatile organic compounds
RELR = Relative risk	= Cell included in Midco II treatment area

[1] Volumes changed per USEPA's notes: 2ST4E51, 2ST4E54, 2ST4F51, 2ST4F54, 2ST4G51, and 2ST4G54 Also, 1ST0A54 should be 267 cy (see 1ST0A51).
Also, 1ST0A54 should be 267 cy (see 1ST0A51).

[2] The %RRED is calculated as RELRi/RELRt, where:

- RELRi is the relative risk produced by each compound (calculated as the Total MPS x volume), and
- RELRt is the total risk produced by each analytical fraction, calculated by adding up all RELRi values for that fraction.

TABLE 2-3
PRIMARY SAMPLES SELECTED TO GUIDE THE LOCATION OF VOC TREATMENT
MIDCO I AND MIDCO II SITES, GARY, INDIANA
(Page 1 of 2)

Medium	Midco I		Midco II	
	Area	Sampling Locations	Area	Sampling Locations
Soil	Cell 1	Monitoring well MW-6S. Extraction well EW-5. SPLP cells 1ST3E94, 1ST3D14, 1ST3E91, 1ST3C54, 1ST2E54, 1ST3E31, 1ST3E11, 1ST2D54, 1ST1F54, 1ST3D31, and 1ST2G51. RI trenches ST-2, ST-6, ST-9, and ST-14. Soil samples MW-6 and J-30.	Cell 1	Presence of the former filter bed and sludge pit. Monitoring wells C-10, C-30, R-10, and R-50. Extraction well EW-6. RI trench ST-13. Soil samples MW-6 and J-30. 2002 trenches A-7 and A-8.
	Cell 2	Monitoring well MW-5S. Extraction well EW-3. SPLP cells 1ST4E54, 1ST4E51, 1ST4E14, 1ST5E91, 1ST4D71, 1ST4E11, 1ST6G14, 1ST5E54, 1ST4D14, 1ST6F14, 1ST5F34, 1ST4D11, and 1ST5H41. RI trenches ST-3, ST-4, ST-5, ST-8, ST-10, and ST-11. Soil samples MW-2 and MW-5.	Cell 2	Presence of the former filter bed. SPLP cell 2ST3E94. RI trench ST-8. Soil samples E-30 and MW-5. 2002 trench B-3.
			Cell 3	Presence of the former filter bed. Monitoring wells E-10, F-10, G-10, and G-30. Extraction well EW-4. SPLP cells 2ST1I54, 2ST3H14, 2ST5G54, 2ST4I51, 2ST1I51, 2ST3G14, 2ST3G34, 2ST2G31, and 2ST2G34. RI trenches ST-5, ST-6, ST-8, ST-10A, and ST-15. Soil samples E-30 and F-30. 2002 trenches A-2 and AA-3.
			Cell 4	Monitoring well MW-1. Extraction wells EW-3 and EW-1. SPLP cells 2ST3R54, 2ST3L54, 2ST2L54, 2ST4K51,and

TABLE 2-3
PRIMARY SAMPLES SELECTED TO GUIDE THE LOCATION OF VOC TREATMENT
MIDCO I AND MIDCO II SITES, GARY, INDIANA
(Page 2 of 2)

Medium	Midco I		Midco II	
	Area	Sampling Locations	Area	Sampling Locations
				2ST1R51.
Ground Water	NA	NA	Cell 1	Presence of the former filter bed. Monitoring wells C-10, C-30, R-10, and R-50. Extraction well EW-6.
			Cell 2	Presence of the former filter bed.
			Cell 3	Presence of the former filter bed. Monitoring wells E-10, F-10, G-10, G-30, MW-4D (?), and T-50. Extraction well EW-4.
			Cell 4	Monitoring well MW-1. Extraction wells EW-3 and EW-1.

Key:

NA = Not applicable
RI = Remedial Investigation
SPLP = Synthetic precipitation leaching procedure

TABLE 3-1
ESTIMATED MASS OF ORGANICS IN SOIL (RI DATA) - MIDCO I SITE, GARY, INDIANA
(Page 1 of 5)

Sample Name:	*D-10*	*D-10*	*J-30*	*MW-2*	*MW-3*	*MW-5*
Sampling Depth:	*4.5*	*7.5*	*8*	*1.5*	*5.5*	*6.5*
VOLATILE ORGANIC COMPOUNDS (ug/kg)						
METHYLENE CHLORIDE	140			540		5,000
ACETONE			22,000	1,300		18,000
CHLOROFORM						
2-BUTANONE			9,400	5,500		31,000
1,1,1-TRICHLOROETHANE						
1,1,2,2-TETRACHLOROETHANE						
TRICHLOROETHENE						
BENZENE						
4-METHYL-2-PENTANONE		4.9	1,200			8,400
TETRACHLOROETHENE						
TRANS-1,2-DICHLOROETHENE						
2-HEXANONE						
STYRENE						
TOLUENE		16	24	130		13,000
CHLOROBENZENE						
ETHYLBENZENE	12	21	11	1,600		5,000
TOTAL XYLENES	67	120	56	2,200		29,800
1,4-DICHLOROBENZENE						
Total VOCs	219	162	32,691	11,270	0.00	110,200
SEMIVOLATILE ORGANIC COMPOUNDS (ug/kg)						
PHENOL			14,000			220,000
CRESOL			480			
ISOPHORONE						
BENZOIC ACID			25,000			
NAPHTHALENE		46		7,400		
DIETHYLPHTHALATE						
PENTACHLOROPHENOL						
DI-N-BUTYLPHTHALATE	5.3			6,200		
BUTYLBENZYLPHTHALATE		89	740			
BENZO(A)ANTHRACENE						
BIS(2-ETHYLHEXYL)PHTHALATE	*190*	*93*	*1,100*	*160,000*		*28,000*
CHRYSENE						
BENZO(B)FLUORANTHENE						
BENZO(A)PYRENE						
INDENO(1,2,3-CD)PYRENE						
DIBENZ(A,H)ANTHRACENE						
2-METHYLPHENOL						
4-METHYLPHENOL			480			
N-NITROSODIPROPYLAMINE						
2,4-DIMETHYLPHENOL						
4-CHLORO-3-METHYLPHENOL						
2-METHYLNAPHTHALENE				10,000		
ACENAPHTHENE						
DIBENZOFURAN						
FLUORENE						
PHENANTHRENE				2,600		
ANTHRACENE						
FLUORANTHENE				3,000		
PYRENE						
DI-N-OCTYLPHTHALATE				12,000		
BENZO(K)FLUORANTHENE						
BENZO(G,H,I)PERYLENE						
Total SVOCs	195	228	41,800	201,200	0.00	248,000
Total organics concentration, ug/kg (1E-9 lb/lb)	414	390	74,491	212,470	0.00	358,200
Safety factor to account for Tent. Identif. Comp.	2	2	2	2	2	2
Related surface area, ft^2	7.20E+03	7.20E+03	1.80E+03	1.08E+04	9.00E+03	5.40E+03
Soil depth, ft	6	4	10	5	10	10
Related soil volume, ft^3	4.32E+04	2.88E+04	1.80E+04	5.40E+04	9.00E+04	5.40E+04
Soil density, lb/ft^3	9.00E+01	9.00E+01	9.00E+01	9.00E+01	9.00E+01	9.00E+01
Related soil mass, lb	3.89E+06	2.59E+06	1.62E+06	4.86E+06	8.10E+06	4.86E+06
Total mass of organics, lb	3.22	2.02	241.35	2,065.21	0.00	3,481.70

TABLE 3-1
ESTIMATED MASS OF ORGANICS IN SOIL (RI DATA) - MIDCO I SITE, GARY, INDIANA
(Page 2 of 5)

Sample Name:	*MW-6*	*MW-6*	*ST-2*	*ST-2*	*ST-3*	*ST-4*
Sampling Depth:	*4*	*5.5*	*2*	*3*	*2*	*3.5*
VOLATILE ORGANIC COMPOUNDS (ug/kg)						
METHYLENE CHLORIDE	88	60				3,600,000
ACETONE	1,700	1,400			5,200	
CHLOROFORM		22				
2-BUTANONE	2,500	2,500			12,000	47,000
1,1,1-TRICHLOROETHANE						
1,1,2,2-TETRACHLOROETHANE		8.6				
TRICHLOROETHENE			110,000	85,000		140,000
BENZENE						0
4-METHYL-2-PENTANONE	420	320				100,000
TETRACHLOROETHENE			45,000	54,000		350,000
TRANS-1,2-DICHLOROETHENE						
2-HEXANONE	18	31				72,000
STYRENE	6.8		280,000			
TOLUENE	110	100	910,000	2,300,000	3,000	2,600,000
CHLOROBENZENE						
ETHYLBENZENE	18	110	100,000	420,000	700	630,000
TOTAL XYLENES	98	420	490,000	2,400,000	7,400	3,500,000
1,4-DICHLOROBENZENE						
Total VOCs	4,959	4,972	1,935,000	5,259,000	28,300	11,039,000
SEMIVOLATILE ORGANIC COMPOUNDS (ug/						
PHENOL	17,000	92,000	130,000	900,000	1,600	5,000,000
CRESOL	530	11,000				
ISOPHORONE					15,000	
BENZOIC ACID	15,000	11,000				
NAPHTHALENE	760		30,000	94,000	1,200	260,000
DIETHYLPHTHALATE						
PENTACHLOROPHENOL						
DI-N-BUTYLPHTHALATE	800	680	6,900	28,000		190,000
BUTYLBENZYLPHTHALATE	400					430,000
BENZO(A)ANTHRACENE			64,000	47,000		
BIS(2-ETHYLHEXYL)PHTHALATE	4,700	5,500	130,000	760,000	2,400	1,300,000
CHRYSENE			64,000	42,000	210	
BENZO(B)FLUORANTHENE			47,000	56,000		68,000
BENZO(A)PYRENE			24,000	29,000		
INDENO(1,2,3-CD)PYRENE			14,000	13,000		
DIBENZ(A,H)ANTHRACENE			4,200	6,400		
2-METHYLPHENOL						
4-METHYLPHENOL	530	11,000				
N-NITROSODIPROPYLAMINE						
2,4-DIMETHYLPHENOL						
4-CHLORO-3-METHYLPHENOL						
2-METHYLNAPHTHALENE			8,000	33,000		140,000
ACENAPHTHENE			11,000	18,000		
DIBENZOFURAN			8,200	10,000		
FLUORENE			12,000	17,000		
PHENANTHRENE			110,000	130,000	230	160,000
ANTHRACENE			110,000	26,000		210,000
FLUORANTHENE			94,000	150,000	190	160,000
PYRENE			58,000	96,000	230	110,000
DI-N-OCTYLPHTHALATE	1,600					
BENZO(K)FLUORANTHENE			47,000	56,000		68,000
BENZO(G,H,I)PERYLENE			18,000	12,000		
Total SVOCs	41,320	131,180	990,300	2,523,400	21,060	8,096,000
Total organics concentration, ug/kg (1E-9 lb/lb)	46,279	136,152	2,925,300	7,782,400	49,360	19,135,000
Safety factor to account for Tent. Identif. Comp.	2	2	2	2	2	2
Related surface area, ft^2	7.20E+03	7.20E+03	2.70E+03	2.70E+03	4.05E+03	7.20E+03
Soil depth, ft	4	6	2	8	10	5
Related soil volume, ft^3	2.88E+04	4.32E+04	5.40E+03	2.16E+04	4.05E+04	3.60E+04
Soil density, lb/ft^3	9.00E+01	9.00E+01	9.00E+01	9.00E+01	9.00E+01	9.00E+01
Related soil mass, lb	2.59E+06	3.89E+06	4.86E+05	1.94E+06	3.65E+06	3.24E+06
Total mass of organics, lb	239.91	1,058.71	2,843.39	30,257.97	359.83	123,994.80

TABLE 3-1
ESTIMATED MASS OF ORGANICS IN SOIL (RI DATA) - MIDCO I SITE, GARY, INDIANA
(Page 3 of 5)

Sample Name:	*ST-4*	*ST-5*	*ST-5*	*ST-6*	*ST-6*
Sampling Depth:	*5.5*	*2*	*6.5*	*4.5*	*7*
VOLATILE ORGANIC COMPOUNDS (ug/kg)					
METHYLENE CHLORIDE	200,000	3,200		380,000	45,000
ACETONE	52,000	22,000	28,000		29,000
CHLOROFORM					
2-BUTANONE		28,000	24,000		42,000
1,1,1-TRICHLOROETHANE					
1,1,2,2-TETRACHLOROETHANE					
TRICHLOROETHENE	40,000	10,000		210,000	41,000
BENZENE	14,000				
4-METHYL-2-PENTANONE	39,000	35,000	29,000	240,000	37,000
TETRACHLOROETHENE	44,000	21,000			9,200
TRANS-1,2-DICHLOROETHENE		2,600			
2-HEXANONE					
STYRENE					
TOLUENE	1,000,000	220,000	180,000	3,000,000	220,000
CHLOROBENZENE					
ETHYLBENZENE	260,000	100,000	65,000	470,000	52,000
TOTAL XYLENES	1,500,000	460,000	330,000	2,500,000	260,000
1,4-DICHLOROBENZENE					
Total VOCs	3,149,000	901,800	656,000	6,800,000	735,200
SEMIVOLATILE ORGANIC COMPOUNDS (ug/					
PHENOL	1,800,000	780,000	35,000	4,100	110,000
CRESOL				2,200	
ISOPHORONE		81,000		2,500	
BENZOIC ACID				4,500	
NAPHTHALENE	120,000	58,000	15,000	4,200	12,000
DIETHYLPHTHALATE					
PENTACHLOROPHENOL					
DI-N-BUTYLPHTHALATE	62,000	34,000	5,100	1,200	5,100
BUTYLBENZYLPHTHALATE	84,000			860	
BENZO(A)ANTHRACENE				1,500	
BIS(2-ETHYLHEXYL)PHTHALATE	940,000	170,000	43,000	34,000	44,000
CHRYSENE				1,600	
BENZO(B)FLUORANTHENE				3,700	
BENZO(A)PYRENE				1,300	
INDENO(1,2,3-CD)PYRENE					
DIBENZ(A,H)ANTHRACENE					
2-METHYLPHENOL					
4-METHYLPHENOL				2,200	
N-NITROSODIPROPYLAMINE					
2,4-DIMETHYLPHENOL					
4-CHLORO-3-METHYLPHENOL					
2-METHYLNAPHTHALENE	73,000	110,000	8,400	1,200	
ACENAPHTHENE		7,600		480	
DIBENZOFURAN				340	
FLUORENE				500	
PHENANTHRENE				2,700	
ANTHRACENE				580	
FLUORANTHENE		6,600		3,600	
PYRENE				2,800	
DI-N-OCTYLPHTHALATE		14,000		2,400	
BENZO(K)FLUORANTHENE				3,700	
BENZO(G,H,I)PERYLENE					
Total SVOCs	3,079,000	1,261,200	106,500	82,160	171,100
Total organics concentration, ug/kg (1E-9 lb/lb)	6,228,000	2,163,000	762,500	6,882,160	906,300
Safety factor to account for Tent. Identif. Comp.	2	2	2	2	2
Related surface area, ft^2	7.20E+03	5.40E+03	5.40E+03	8.10E+03	8.10E+03
Soil depth, ft	5	5	5	6	4
Related soil volume, ft^3	3.60E+04	2.70E+04	2.70E+04	4.86E+04	3.24E+04
Soil density, lb/ft^3	9.00E+01	9.00E+01	9.00E+01	9.00E+01	9.00E+01
Related soil mass, lb	3.24E+06	2.43E+06	2.43E+06	4.37E+06	2.92E+06
Total mass of organics, lb	40,357.44	10,512.18	3,705.75	60,205.14	5,285.54

TABLE 3-1
ESTIMATED MASS OF ORGANICS IN SOIL (RI DATA) - MIDCO I SITE, GARY, INDIANA
(Page 4 of 5)

Sample Name:	*ST-8*	*ST-8*	*ST-9*	*ST-10*	*ST-10*	*ST-11*
Sampling Depth:	*3.5*	*4*	*2.5*	*1.5*	*5*	*1.5*
VOLATILE ORGANIC COMPOUNDS (ug/kg)						
METHYLENE CHLORIDE	420,000	260,000	310,000			600
ACETONE	240,000	480,000	56,000	6,800	8,200	5,700
CHLOROFORM						
2-BUTANONE	820,000	880,000		9,800	16,000	13,000
1,1,1-TRICHLOROETHANE	230,000	110,000	17,000			
1,1,2,2-TETRACHLOROETHANE						
TRICHLOROETHENE	480,000	840,000	100,000			640
BENZENE						
4-METHYL-2-PENTANONE	530,000	320,000	38,000	5,400	4,300	4,000
TETRACHLOROETHENE		74,000	350,000			19,000
TRANS-1,2-DICHLOROETHENE						710
2-HEXANONE						
STYRENE						
TOLUENE	4,100,000	3,600,000	1,300,000	25,000	8,600	18,000
CHLOROBENZENE		640,000				
ETHYLBENZENE	400,000	3,100,000	140,000	24,000	4,000	8,200
TOTAL XYLENES	1,800,000		810,000	160,000	26,000	34,000
1,4-DICHLOROBENZENE				290		
Total VOCs	9,020,000	10,304,000	3,121,000	231,290	67,100	103,850
SEMIVOLATILE ORGANIC COMPOUNDS (ug/						
PHENOL	94,000	280,000	76,000	5,000		5,000
CRESOL				2,700	8,400	700
ISOPHORONE						2,900
BENZOIC ACID					3,700	4,900
NAPHTHALENE	130,000	130,000	36,000			5,100
DIETHYLPHTHALATE					1,200	
PENTACHLOROPHENOL	26,000	8,800		24,000		
DI-N-BUTYLPHTHALATE	73,000	110,000	7,400	1,700		1,600
BUTYLBENZYLPHTHALATE	14,000		5,500			930
BENZO(A)ANTHRACENE	32,000	39,000	7,400	1,700	55	10,000
BIS(2-ETHYLHEXYL)PHTHALATE	1,200,000	870,000	69,000	36,000		35,000
CHRYSENE	37,000	38,000	8,600	1,800	60	5,800
BENZO(B)FLUORANTHENE	41,000	48,000	6,100	3,000	110	8,500
BENZO(A)PYRENE	14,000	24,000	6,300	1,300		4,700
INDENO(1,2,3-CD)PYRENE		9,700	3,000			
DIBENZ(A,H)ANTHRACENE						460
2-METHYLPHENOL				2,700	800	700
4-METHYLPHENOL					7,600	
N-NITROSODIPROPYLAMINE						620
2,4-DIMETHYLPHENOL					200	
4-CHLORO-3-METHYLPHENOL						
2-METHYLNAPHTHALENE	37,000	120,000	23,000	940		1,500
ACENAPHTHENE	18,000	26,000	4,000	570		1,000
DIBENZOFURAN	13,000	22,000	2,500	0		720
FLUORENE	18,000	23,000	3,400	650		1,600
PHENANTHRENE	100,000	110,000	20,000	3,600		8,800
ANTHRACENE	150,000	110,000	5,100	0		2,800
FLUORANTHENE	100,000	140,000	30,000	4,800	76	11,000
PYRENE	80,000	100,000	20,000	2,900	82	9,700
DI-N-OCTYLPHTHALATE	73,000	60,000	4,000	3,700		3,500
BENZO(K)FLUORANTHENE	41,000	48,000	6,100	3,000	110	12,000
BENZO(G,H,I)PERYLENE						1,300
Total SVOCs	2,291,000	2,316,500	343,400	100,060	22,393	140,830
Total organics concentration, ug/kg (1E-9 lb/lb)	11,311,000	12,620,500	3,464,400	331,350	89,493	244,680
Safety factor to account for Tent. Identif. Comp.	2	2	2	2	2	2
Related surface area, ft^2	1.80E+03	1.80E+03	5.40E+03	2.70E+03	2.70E+03	4.05E+03
Soil depth, ft	4	6	10	4	6	3.5
Related soil volume, ft^3	7.20E+03	1.08E+04	5.40E+04	1.08E+04	1.62E+04	1.42E+04
Soil density, lb/ft^3	9.00E+01	9.00E+01	9.00E+01	9.00E+01	9.00E+01	9.00E+01
Related soil mass, lb	6.48E+05	9.72E+05	4.86E+06	9.72E+05	1.46E+06	1.28E+06
Total mass of organics, lb	14,659.06	24,534.25	33,673.97	644.14	260.96	624.30

TABLE 3-1
ESTIMATED MASS OF ORGANICS IN SOIL (RI DATA) - MIDCO I SITE, GARY, INDIANA
(Page 5 of 5)

Sample Name:	*ST-11*	*ST-13*	*ST-14*	*Total*
Sampling Depth:	4	3.5	3	
VOLATILE ORGANIC COMPOUNDS (ug/kg)				
METHYLENE CHLORIDE	880		880	
ACETONE	10,000	660	4,000	
CHLOROFORM				
2-BUTANONE	30,000	450	12,000	
1,1,1-TRICHLOROETHANE				
1,1,2,2-TETRACHLOROETHANE				
TRICHLOROETHENE		13		
BENZENE				
4-METHYL-2-PENTANONE	24,000	240		
TETRACHLOROETHENE		210		
TRANS-1,2-DICHLOROETHENE				
2-HEXANONE				
STYRENE				
TOLUENE	20,000	180	810	
CHLOROBENZENE				
ETHYLBENZENE	670	270	530	
TOTAL XYLENES	1,800	920	1,900	
1,4-DICHLOROBENZENE				
Total VOCs	87,350	2,943	20,120	
SEMIVOLATILE ORGANIC COMPOUNDS (ug/				
PHENOL	1,800			
CRESOL	5,810			
ISOPHORONE	550			
BENZOIC ACID	6,800			
NAPHTHALENE				
DIETHYLPHTHALATE				
PENTACHLOROPHENOL				
DI-N-BUTYLPHTHALATE				
BUTYLBENZYLPHTHALATE			75	
BENZO(A)ANTHRACENE			48	
BIS(2-ETHYLHEXYL)PHTHALATE	490		760	
CHRYSENE				
BENZO(B)FLUORANTHENE				
BENZO(A)PYRENE				
INDENO(1,2,3-CD)PYRENE				
DIBENZ(A,H)ANTHRACENE				
2-METHYLPHENOL	810			
4-METHYLPHENOL	5,000			
N-NITROSODIPROPYLAMINE				
2,4-DIMETHYLPHENOL	280			
4-CHLORO-3-METHYLPHENOL	94			
2-METHYLNAPHTHALENE				
ACENAPHTHENE				
DIBENZOFURAN				
FLUORENE				
PHENANTHRENE	56			
ANTHRACENE				
FLUORANTHENE	78		44	
PYRENE	50		44	
DI-N-OCTYLPHTHALATE				
BENZO(K)FLUORANTHENE				
BENZO(G,H,I)PERYLENE				
Total SVOCs	21,818	0.00	971	
Total organics concentration, ug/kg (1E-9 lb/lb)	109,168	2,943	21,091	
Safety factor to account for Tent. Identif. Comp.	2	2	2	
Related surface area, ft^2	4.05E+03	8.10E+03	8.10E+03	
Soil depth, ft	6.5	10	10	
Related soil volume, ft^3	2.63E+04	8.10E+04	8.10E+04	
Soil density, lb/ft^3	9.00E+01	9.00E+01	9.00E+01	
Related soil mass, lb	2.37E+06	7.29E+06	7.29E+06	
Total mass of organics, lb	517.29	42.91	307.51	359,879

TABLE 4-1

ESTIMATED MASS OF ORGANICS IN SOIL (RI AND 2002 TRENCHING DATA) - MIDCO II SITE, GARY, INDIANA

(Page 1 of 4)

Sampling Location:	*D-10*	*E-30*	*H-30*	*MW-2*	*ST-3*	*ST-4*	*ST-4*	*ST-5*	*ST-5*
Sampling Depth (ft):	*1.5*	*7.5*	*1.5*	*2*	*0.5*	*3.6*	*4.5*	*2*	*3*
VOLATILE ORGANIC COMPOUNDS (ug/kg)									
ACETONE	66	11,000				150		150	3,700
BENZENE				2					
BROMOMETHANE									
2-BUTANONE						37		33	12,000
CARBON DISULFIDE				9					
CARBON TETRACHLORIDE				4					
CHLOROBENZENE					30				
CHLOROETHANE									
CHLOROFORM				15					
1,2-DIBROMO-3-CHLOROPROPANE									
1,2-DICHLOROBENZENE									
1,4-DICHLOROBENZENE					1,600				
1,1-DICHLOROETHANE									
CIS-1,2-DICHLOROETHENE									
TRANS-1,2-DICHLOROETHENE									
1,2-DICHLOROPROPANE									
ETHYL BENZENE		190,000			7	15	150	520	1,600
METHYLENE CHLORIDE	47					59		40	540
4-METHYL-2-PENTANONE									
1,1,2,2-TETRACHLOROETHANE						3			
TETRACHLOROETHENE		3,400			5	8	9		200
TOLUENE		180,000		1	5	32	31	360	1,100
1,1,1-TRICHLOROETHANE							28		
1,1,2-TRICHLOROETHANE					5				
TRICHLOROETHENE		3,400		4	3				
XYLENES	3	530,000			52		390	3,200	5,200
Total VOCs	116	917,800	0	36	1,708	304	608	4,303	24,340
SEMIVOLATILE ORGANIC COMPOUNDS (ug/kg)									
ACENAPHTHENE		310					6,400		840
ACENAPHTHYLENE									
ACETOPHENONE									
ANTHRACENE		790		63		16,000			480
BENZO(A)ANTHRACENE		1,800	80	460	500				2,400
BENZO(A)PYRENE		1,200		410	190	540			880
BENZO(B)FLUORANTHENE		2,400		370					
BENZO(G,H,I)PERYLENE		690		230					
BENZO(K)FLUORANTHENE		2,400		370					
1,1'-BIPHENYL									
BIS(2-ETHYLHEXYL)PHTHALATE		9,800	930	470	15,000	1,700	3,400		1,200
BUTYL BENZYL PHTHALATE		840			500				
CARBAZOLE									
CHRYSENE		1,500	80	600	350	1,400			1,500
CRESOL									
DIBENZ(A,H)ANTHRACENE									
DIBENZOFURAN		210				5,300			
2,4-DICHLOROPHENOL									
DIETHYLPHTHALATE									
2,4-DIMETHYLPHENOL									
DI-N-BUTYLPHTHALATE		1,500	44	89	370			5,100	330
DI-N-OCTYLPHTHALATE		4,500	97		2,100				
FLUORANTHENE		5,700	44	140	460	660			1,600
FLUORENE		370		78		11,000	9,400	3,500	1,100
INDENO(1,2,3-CD)PYRENE		680		120					
ISOPHORONE		10,000			2,200				
2-METHYLNAPHTHALENE		2,000		970	250	18,000	91,000	40,000	14,000
2-METHYLPHENOL									
4-METHYLPHENOL									
NAPHTHALENE		7,000		240	310		9,400	8,000	3,900
N-NITROSODIPHENYLAMINE		600			210				
PHENANTHRENE		3,800		450	270	16,000	9,400	12,000	4,000
PHENOL									940
PYRENE		2,600	50	310	410	2,200	2,000	3,700	2,000
Total SVOCs	0.0	60,690	1,325	5,370	23,120	72,800	131,000	72,300	35,170
Total organics concentration, ug/kg (1E-9 lb/lb)	116.40	978,490	1,325	5,406	24,828	73,104	131,608	76,603	59,510
Safety factor to account for Tent. Identif. Comp.	2	2	2	2	2	2	2	2	2
Related surface area, ft^2	4.7E+03	2.7E+03	2.8E+04	6.3E+03	0.0E+00	6.1E+04	6.1E+04	5.4E+03	5.4E+03
Soil depth, ft	10	10	10	10	10	4	6	2.5	2.5
Related soil volume, ft^3	4.7E+04	2.7E+04	2.8E+05	6.3E+04	0.0E+00	2.4E+05	3.7E+05	1.4E+04	1.4E+04
Soil density, lb/ft^3	9.0E+01	9.0E+01	9.0E+01	9.0E+01	9.0E+01	9.0E+01	9.0E+01	9.0E+01	9.0E+01
Related soil mass, lb	4.3E+06	2.4E+06	2.5E+07	5.7E+06	0.0E+00	2.2E+07	3.3E+07	1.2E+06	1.2E+06
Total mass of organics, lb	0.99	4,755	67	61	0.00	3,221	8,699	186	145

TABLE 4-1

ESTIMATED MASS OF ORGANICS IN SOIL (RI AND 2002 TRENCHING DATA) - MIDCO II SITE, GARY, INDIANA

(Page 2 of 4)

Sampling Location:	*ST-5*	*ST-6*	*ST-6*	*ST-6*	*ST-8*	*ST-8*	*ST-10A*	*ST-10A*
Sampling Depth (ft):	*5*	*0.5*	*4*	*7*	*1.5*	*8*	*0.5*	*4*
VOLATILE ORGANIC COMPOUNDS (ug/kg)								
ACETONE	9,700	3,200	190		170	51,000	110	
BENZENE								
BROMOMETHANE								
2-BUTANONE		11,000			110			
CARBON DISULFIDE								
CARBON TETRACHLORIDE								
CHLOROBENZENE								
CHLOROETHANE								
CHLOROFORM								
1,2-DIBROMO-3-CHLOROPROPANE								
1,2-DICHLOROBENZENE								
1,4-DICHLOROBENZENE								
1,1-DICHLOROETHANE								
CIS-1,2-DICHLOROETHENE								
TRANS-1,2-DICHLOROETHENE								
1,2-DICHLOROPROPANE		280	270					
ETHYL BENZENE	480,000	3,400		20,000	140	780,000	380	43
METHYLENE CHLORIDE		1,900	130		53		50	
4-METHYL-2-PENTANONE			53		150		68	
1,1,2,2-TETRACHLOROETHANE							0	
TETRACHLOROETHENE		5,800				14,000	110	
TOLUENE	420,000	7,600	18	13,000	330	1,100,000	440	20
1,1,1-TRICHLOROETHANE								
1,1,2-TRICHLOROETHANE		1,700					140	
TRICHLOROETHENE	8,300	2,000	24				35	
XYLENES	1,200,000	20,000		110,000	670	1,800,000	2,100	290
Total VOCs	2,118,000	56,880	685	143,000	1,623	3,745,000	3,433	353
SEMIVOLATILE ORGANIC COMPOUNDS (u								
ACENAPHTHENE								
ACENAPHTHYLENE								1,400
ACETOPHENONE								
ANTHRACENE			230	16,000				7,300
BENZO(A)ANTHRACENE			1,600			3,100		720
BENZO(A)PYRENE			350			2,800		
BENZO(B)FLUORANTHENE			660		57	4,500		
BENZO(G,H,I)PERYLENE			320					
BENZO(K)FLUORANTHENE			660		57	4,500		
1,1'-BIPHENYL								
BIS(2-ETHYLHEXYL)PHTHALATE	12,000	260,000	960		68	57,000	83,000	
BUTYL BENZYL PHTHALATE		15,000				4,300		
CARBAZOLE								
CHRYSENE			1,600			3,800		1,300
CRESOL					1,990			
DIBENZ(A,H)ANTHRACENE								
DIBENZOFURAN								3,200
2,4-DICHLOROPHENOL		27,000						
DIETHYLPHTHALATE								
2,4-DIMETHYLPHENOL					340			
DI-N-BUTYLPHTHALATE		10,000	170		180	5,500	2,900	
DI-N-OCTYLPHTHALATE	5,300	12,000			78	24,000	11,000	
FLUORANTHENE	3,700	3,400	320			6,900		3,000
FLUORENE		2,900		11,000				
INDENO(1,2,3-CD)PYRENE			180					
ISOPHORONE		14,000			170	29,000	14,000	
2-METHYLNAPHTHALENE		26,000	2,800	96,000	99	10,000	19,000	27,000
2-METHYLPHENOL					1,000			
4-METHYLPHENOL					990			
NAPHTHALENE	8,400	16,000	810	22,000	57	47,000	6,400	
N-NITROSODIPHENYLAMINE					94	3,300	4,400	
PHENANTHRENE	3,400	8,400	1,100	20,000	63	9,300	3,500	15,000
PHENOL		3,400	360					
PYRENE	2,600	3,400	1,200		63	9,000		2,300
Total SVOCs	35,400	401,500	13,320	165,000	5,306	224,000	144,200	61,220
Total organics concentration, ug/kg (1E-9 lb/lb)	2,153,400	458,380	14,005	308,000	6,929	3,969,000	147,633	61,573
Safety factor to account for Tent. Identif. Comp.	2	2	2	2	2	2	2	2
Related surface area, ft^2	5.4E+03	9.5E+03	9.5E+03	9.5E+03	5.4E+03	5.4E+03	6.3E+03	6.3E+03
Soil depth, ft	5	3	3	4	7	3	3	7
Related soil volume, ft^3	2.7E+04	2.8E+04	2.8E+04	3.8E+04	3.8E+04	1.6E+04	1.9E+04	4.4E+04
Soil density, lb/ft^3	9.0E+01	9.0E+01	9.0E+01	9.0E+01	9.0E+01	9.0E+01	9.0E+01	9.0E+01
Related soil mass, lb	2.4E+06	2.6E+06	2.6E+06	3.4E+06	3.4E+06	1.5E+06	1.7E+06	4.0E+06
Total mass of organics, lb	10,466	2,339	71	2,096	47	11,574	502	489

TABLE 4-1

ESTIMATED MASS OF ORGANICS IN SOIL (RI AND 2002 TRENCHING DATA) - MIDCO II SITE, GARY, INDIANA

(Page 3 of 4)

Sampling Location:	*ST-13*	*ST-13*	*ST-14*	*ST-14*	*ST-15*	*ST-15*	*F-30*	*A-2*
Sampling Depth (ft):	*2.5*	*6.5*	*4.5*	*9.5*	*1.5*	*4.5*	*10.5*	*5*
VOLATILE ORGANIC COMPOUNDS (ug/kg)								
ACETONE	3,800	2,900	3,000	23,000				
BENZENE						19		
BROMOMETHANE								2,100
2-BUTANONE	8,100	10,000	9,500			12	9	
CARBON DISULFIDE								
CARBON TETRACHLORIDE								
CHLOROBENZENE								
CHLOROETHANE								3,500
CHLOROFORM								
1,2-DIBROMO-3-CHLOROPROPANE								
1,2-DICHLOROBENZENE								
1,4-DICHLOROBENZENE								
1,1-DICHLOROETHANE								
CIS-1,2-DICHLOROETHENE								
TRANS-1,2-DICHLOROETHENE							2	
1,2-DICHLOROPROPANE		490					2	
ETHYL BENZENE	23,000	23,000	940	540,000	200,000	13	30	540,000
METHYLENE CHLORIDE		700	190	12,000	23,000			1,700
4-METHYL-2-PENTANONE				27,000			100	
1,1,2,2-TETRACHLOROETHANE								
TETRACHLOROETHENE			2,000	18,000				2,000
TOLUENE	3,000	5,400	1,900	560,000	11,000	13	93	270,000
1,1,1-TRICHLOROETHANE		3,500		14,000				
1,1,2-TRICHLOROETHANE								
TRICHLOROETHENE			870	33,000				410
XYLENES	85,000	78,000	9,600	1,400,000	1,100,000	48	70	1,500,000
Total VOCs	122,900	123,990	28,000	2,627,000	1,334,000	105	307	2,319,710
SEMIVOLATILE ORGANIC COMPOUNDS (u								
ACENAPHTHENE					680	60		550
ACENAPHTHYLENE								58
ACETOPHENONE								
ANTHRACENE	2,800		60		450	190		1,100
BENZO(A)ANTHRACENE			350		330	300		2,400
BENZO(A)PYRENE			510					1,600
BENZO(B)FLUORANTHENE			980			160		1,500
BENZO(G,H,I)PERYLENE			310					760
BENZO(K)FLUORANTHENE			980			160		1,300
1,1'-BIPHENYL								230
BIS(2-ETHYLHEXYL)PHTHALATE				16,000	2,800		160	8,600
BUTYL BENZYL PHTHALATE								970
CARBAZOLE								590
CHRYSENE	420		500		960	300		2,100
CRESOL								
DIBENZ(A,H)ANTHRACENE			60					270
DIBENZOFURAN								470
2,4-DICHLOROPHENOL								
DIETHYLPHTHALATE			180					
2,4-DIMETHYLPHENOL			2,000		7,700	420		
DI-N-BUTYLPHTHALATE				2,600			43	6,000
DI-N-OCTYLPHTHALATE			180	10,000				9,900
FLUORANTHENE			540		410	650		6,900
FLUORENE								690
INDENO(1,2,3-CD)PYRENE			210					1,100
ISOPHORONE			0	11,000	0	290		
2-METHYLNAPHTHALENE	4,500	12,000	93	2,400	1,300	130		3,500
2-METHYLPHENOL								
4-METHYLPHENOL								
NAPHTHALENE	*840*	*1,800*	*76*	*14,000*	*1,900*	*74*		*10,000*
N-NITROSODIPHENYLAMINE								520
PHENANTHRENE	2,800	3,800	300		2,900	340		6,200
PHENOL								
PYRENE			490		1,200	470		5,000
Total SVOCs	11,360	17,600	7,819	56,000	20,630	3,544	203	72,308
Total organics concentration, ug/kg (1E-9 lb/lb)	134,260	141,590	35,819	2,683,000	1,354,630	3,649	510	2,392,018
Safety factor to account for Tent. Identif. Comp.	2	2	2	2	2	2	2	2
Related surface area, ft^2	1.1E+04	1.1E+04	1.9E+04	1.9E+04	6.3E+03	6.3E+03	2.2E+04	1.6E+04
Soil depth, ft	5	5	7	3	4	6	10	3
Related soil volume, ft^3	5.4E+04	5.4E+04	1.3E+05	5.7E+04	2.5E+04	3.8E+04	2.2E+05	4.9E+04
Soil density, lb/ft^3	9.0E+01	9.0E+01	9.0E+01	9.0E+01	9.0E+01	9.0E+01	9.0E+01	9.0E+01
Related soil mass, lb	4.9E+06	4.9E+06	1.2E+07	5.1E+06	2.3E+06	3.4E+06	1.9E+07	4.4E+06
Total mass of organics, lb	1,305	1,376	853	27,383	6,145	25	20	20,925

TABLE 4-1

ESTIMATED MASS OF ORGANICS IN SOIL (RI AND 2002 TRENCHING DATA) - MIDCO II SITE, GARY, INDIANA

(Page 4 of 4)

Sampling Location:	*A-2*	*AA-3*	*AT-7*	*AT-8*	*Total*
Sampling Depth (ft):	*7.5*	*6.5*	*6 - 8*	*9.75*	
VOLATILE ORGANIC COMPOUNDS (ug/kg)					
ACETONE			1,175		
BENZENE			105	3,100	
BROMOMETHANE	1,400	4,800	1,600	25,000	
2-BUTANONE					
CARBON DISULFIDE					
CARBON TETRACHLORIDE					
CHLOROBENZENE					
CHLOROETHANE	480	1,900	985	36,000	
CHLOROFORM					
1,2-DIBROMO-3-CHLOROPROPANE		9,700			
1,2-DICHLOROBENZENE		1,200			
1,4-DICHLOROBENZENE					
1,1-DICHLOROETHANE			39		
CIS-1,2-DICHLOROETHENE		400	315	6,300	
TRANS-1,2-DICHLOROETHENE					
1,2-DICHLOROPROPANE		240	80	9,400	
ETHYL BENZENE	5,800	300,000	35,800	2,200,000	
METHYLENE CHLORIDE	82	770	240	19,000	
4-METHYL-2-PENTANONE					
1,1,2,2-TETRACHLOROETHANE		4,600			
TETRACHLOROETHENE		2,400	105	15,000	
TOLUENE	670	180,000	24,450	3,800,000	
1,1,1-TRICHLOROETHANE					
1,1,2-TRICHLOROETHANE					
TRICHLOROETHENE		1,000	32		
XYLENES	21,000	920,000	87,000	5,600,000	
Total VOCs	29,432	1,427,010	151,925	11,713,800	
SEMIVOLATILE ORGANIC COMPOUNDS (u					
ACENAPHTHENE	160	450			
ACENAPHTHYLENE		140			
ACETOPHENONE	94				
ANTHRACENE	370	1,600	2,700	2,800	
BENZO(A)ANTHRACENE	440	4,000	680	570	
BENZO(A)PYRENE	300	2,500	460	400	
BENZO(B)FLUORANTHENE	310	2,300	290		
BENZO(G,H,I)PERYLENE	110	1,200	340		
BENZO(K)FLUORANTHENE	240	2,700	225		
1,1'-BIPHENYL	26	120	90	660	
BIS(2-ETHYLHEXYL)PHTHALATE	660	8,500	590	5,000	
BUTYL BENZYL PHTHALATE	59	440	60	420	
CARBAZOLE	270	470	600	1,100	
CHRYSENE	360	3,900	1,125	1,100	
CRESOL					
DIBENZ(A,H)ANTHRACENE	28	470	46		
DIBENZOFURAN	140	410	540	740	
2,4-DICHLOROPHENOL					
DIETHYLPHTHALATE					
2,4-DIMETHYLPHENOL					
DI-N-BUTYLPHTHALATE	370	730	175	2,400	
DI-N-OCTYLPHTHALATE	630	4,200	550	2,700	
FLUORANTHENE	1,300	8,500	880	1,100	
FLUORENE	250	720	1,600	1,500	
INDENO(1,2,3-CD)PYRENE	180	1,600	215		
ISOPHORONE					
2-METHYLNAPHTHALENE	110	2,000	4,850	27,000	
2-METHYLPHENOL					
4-METHYLPHENOL	17			1,900	
NAPHTHALENE	250	5,500	1,750	35,000	
N-NITROSODIPHENYLAMINE	40			4,900	
PHENANTHRENE	1,300	7,400	4,400	4,700	
PHENOL					
PYRENE	940	7,300	2,450	1,700	
Total SVOCs	8,954	67,150	24,616	95,690	
Total organics concentration, ug/kg (1E-9 lb/lb)	38,386	1,494,160	176,541	11,809,490	
Safety factor to account for Tent. Identif. Comp.	2	2	2	2	
Related surface area, ft^2	1.6E+04	2.7E+03	8.1E+03	1.3E+04	
Soil depth, ft	3	3	4	3	
Related soil volume, ft^3	4.9E+04	8.1E+03	3.2E+04	3.8E+04	
Soil density, lb/ft^3	9.0E+01	9.0E+01	9.0E+01	9.0E+01	
Related soil mass, lb	4.4E+06	7.3E+05	2.9E+06	3.4E+06	
Total mass of organics, lb	336	2,178	1,030	80,352	**186,646**

TABLE 4-2

ESTIMATED MASS OF ORGANICS IN GROUND WATER (2001 ANNUAL GROUND WATER MONITORING EVENT)
MIDCO II SITE, GARY, INDIANA
(Page 1 of 3)

Well Number:	*MW-1*	*MW-2S*	*MW-4S*	*C-10*	*D-10*	*E-10*	*F-10*
Collection Date:	*2001*	*2001*	*2001*	*2001*	*2001*	*2001*	*2001*
Units:	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Volatile Organic Compounds							
Chloromethane						12	
Vinyl chloride	4	0.2				50	
Chloroethane						33	
Methylene chloride							
Acetone			0			120	1,100
Carbon disulfide			0.1		1		
1,1-Dichloroethane	20		0.6			45	52
cis-1,2-Dichloroethene	9					480	
trans-1,2-Dichloroethene							
1,2-Dichloroethane							
2-Butanone	0		0	0	34	40	
1,1,1-Trichloroethane							
1,2-Dichloropropane					11	30	61
Trichloroethene	65	0.3					
1,1,2-Trichloroethane							
Benzene				8	38	110	
4-Methyl-2-pentanone					32	*690*	*180*
Tetrachloroethene	0.8						
Toluene				1	6	3,000	18,000
Chlorobenzene	0.9						
Ethyl benzene				4	94	1,900	9,800
Xylenes (total)				35	87	11,000	29,000
1,2-Dichlorobenzene	94						
1,2,4-Trichlorobenzene							
Total VOCs	194	0.50	0.70	48	303	17,510	58,193
Semivolatile Organic Compounds							
Phenol				17			
2-Methylphenol						86	
4-Methylphenol					12	79	400
Isophorone	4						
2,4-Dimethylphenol					29	100	
1,2,4-Trichlorobenzene							
Naphthalene				10	37	37	
2-Methylnaphthalene				15	63		
Acenaphthene					2		
Fluorene					2		
Phenanthrene				10	2		
Benzoic Acid							
Total SVOCs	4.0	0.0	0.0	52.0	147.0	302.0	400.0
Total organics concentration, ug/L	197.7	0.5	0.7	100.0	450.0	17,812.0	58,593.0
Safety factor to account for Tent. Ident. Con	2	2	2	2	2	2	2
Related aquifer area, ft^2	3.5E+04	5.3E+04	1.7E+04	1.4E+04	3.7E+04	7.1E+04	3.7E+04
Aquifer depth, ft	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Porosity, ft^3/ft^3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Related aquifer volume, ft^3	2.4E+05	3.5E+05	1.1E+05	9.7E+04	2.5E+05	4.8E+05	2.5E+05
Related aquifer volume, L	6.7E+06	1.0E+07	3.2E+06	2.8E+06	7.1E+06	1.4E+07	7.0E+06
Total mass of organics, ug	2.6E+09	1.0E+07	4.5E+06	5.5E+08	6.4E+09	4.8E+11	8.2E+11
Total mass of organics, lb	5.83	0.02	0.01	1.21	14.01	1,067.67	1,805.39

TABLE 4-2

ESTIMATED MASS OF ORGANICS IN GROUND WATER (2001 ANNUAL GROUND WATER MONITORING EVENT)
MIDCO II SITE, GARY, INDIANA
(Page 2 of 3)

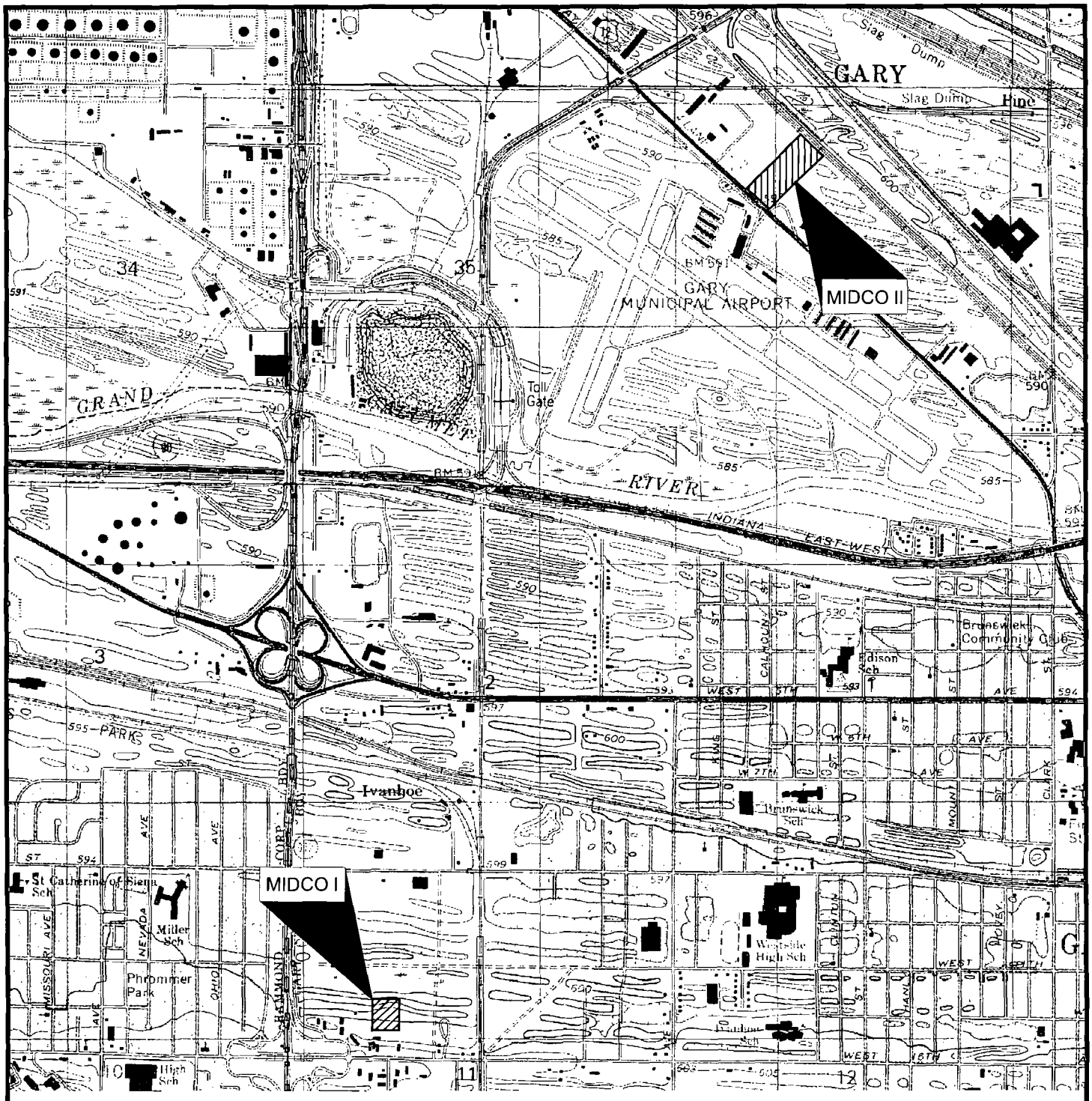
Well Number:	*G-10*	*H-10*	*R-10*	*MW-50*	*MW-2D*	*MW-4D*	*C-30*
Collection Date:	*2001*	*2001*	*2001*	*2001*	*2001*	*2001*	*2001*
Units:	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Volatile Organic Compounds							
Chloromethane							
Vinyl chloride	0.3						3
Chloroethane							
Methylene chloride							
Acetone	0						
Carbon disulfide		0.08					
1,1-Dichloroethane	11						
cis-1,2-Dichloroethene	3		1,900				
trans-1,2-Dichloroethene	0.5						
1,2-Dichloroethane	3						
2-Butanone		0.9		0			0
1,1,1-Trichloroethane	0.4		1,600				
1,2-Dichloropropane	0.4						
Trichloroethene	5			0.2			
1,1,2-Trichloroethane	0.2						
Benzene	3						
4-Methyl-2-pentanone			10,000			2,100	2
Tetrachloroethene	1						
Toluene			77,000		0.1		
Chlorobenzene							
Ethyl benzene	21		17,000				
Xylenes (total)	0.7		49,000				
1,2-Dichlorobenzene				0.1			
1,2,4-Trichlorobenzene	0.1						
Total VOCs	50	0.98	156,500	0.30	0.10	2,100	5.00
Semivolatile Organic Compounds							
Phenol							
2-Methylphenol			680				
4-Methylphenol							
Isophorone							
2,4-Dimethylphenol			560		5		
1,2,4-Trichlorobenzene	0.1						
Naphthalene							
2-Methylnaphthalene							
Acenaphthene							
Fluorene							
Phenanthrene							
Benzoic Acid							
Total SVOCs	0.1	0.0	1240.0	0.0	5.0	0.0	0.0
Total organics concentration, ug/L	49.7	1.0	157,740.0	0.3	5.1	2,100.0	5.0
Safety factor to account for Tent. Ident. Con	2	2	2	2	2	2	2
Related aquifer area, ft^2	2.1E+04	3.5E+04	5.3E+04	3.5E+04	5.3E+04	1.7E+04	1.4E+04
Aquifer depth, ft	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Porosity, ft^3/ft^3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Related aquifer volume, ft^3	1.4E+05	2.4E+05	3.6E+05	2.4E+05	3.5E+05	1.1E+05	9.7E+04
Related aquifer volume, L	4.0E+06	6.7E+06	1.0E+07	6.7E+06	1.0E+07	3.2E+06	2.8E+06
Total mass of organics, ug	4.0E+08	1.3E+07	3.2E+12	4.0E+06	1.0E+08	1.3E+10	2.8E+07
Total mass of organics, lb	0.87	0.03	7,051.50	0.01	0.23	29.70	0.06
		Shallow	**9,947**				

TABLE 4-2

ESTIMATED MASS OF ORGANICS IN GROUND WATER (2001 ANNUAL GROUND WATER MONITORING EVENT)
MIDCO II SITE, GARY, INDIANA
(Page 3 of 3)

Well Number:	*D-30*	*E-50*	*F-30*	*G-30*	*H-30*	*R-50*	
Collection Date:	*2001*	*2001*	*2001*	*2001*	*2001*	*2001*	*Total*
Units:	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Volatile Organic Compounds							
Chloromethane					1		
Vinyl chloride	0.2						
Chloroethane							
Methylene chloride				2			
Acetone							
Carbon disulfide	0.2	30		0.5	0.1		
1,1-Dichloroethane							
cis-1,2-Dichloroethene	0.2						
trans-1,2-Dichloroethene							
1,2-Dichloroethane							
2-Butanone				0	2	660	
1,1,1-Trichloroethane							
1,2-Dichloropropane							
Trichloroethene							
1,1,2-Trichloroethane							
Benzene	0.6						
4-Methyl-2-pentanone			3200	110	0.7	950	
Tetrachloroethene							
Toluene				0.4			
Chlorobenzene							
Ethyl benzene							
Xylenes (total)							
1,2-Dichlorobenzene							
1,2,4-Trichlorobenzene							
Total VOCs	1.20	30	3,200	113	3.80	1,610	
Semivolatile Organic Compounds							
Phenol						66	
2-Methylphenol							
4-Methylphenol							
Isophorone			7			56	
2,4-Dimethylphenol	3				1		
1,2,4-Trichlorobenzene							
Naphthalene	4						
2-Methylnaphthalene	8						
Acenaphthene							
Fluorene							
Phenanthrene							
Benzoic Acid					2		
Total SVOCs	15.0	0.0	7.0	0.0	3.0	122.0	
Total organics concentration, ug/L	16.2	30.0	3,207.0	112.9	6.8	1,732.0	
Safety factor to account for Tent. Ident. Con	2	2	2	2	2	2	
Related aquifer area, ft^2	3.7E+04	7.1E+04	3.7E+04	2.1E+04	3.5E+04	5.3E+04	
Aquifer depth, ft	22.5	22.5	22.5	22.5	22.5	22.5	
Porosity, ft^3/ft^3	0.3	0.3	0.3	0.3	0.3	0.3	
Related aquifer volume, ft^3	2.5E+05	4.8E+05	2.5E+05	1.4E+05	2.4E+05	3.6E+05	
Related aquifer volume, L	7.1E+06	1.4E+07	7.0E+06	4.0E+06	6.7E+06	1.0E+07	
Total mass of organics, ug	2.3E+08	8.2E+08	4.5E+10	9.0E+08	9.1E+07	3.5E+10	
Total mass of organics, lb	0.50	1.80	98.82	1.98	0.20	77.43	10,157
					Deep	211	Total

FIGURES

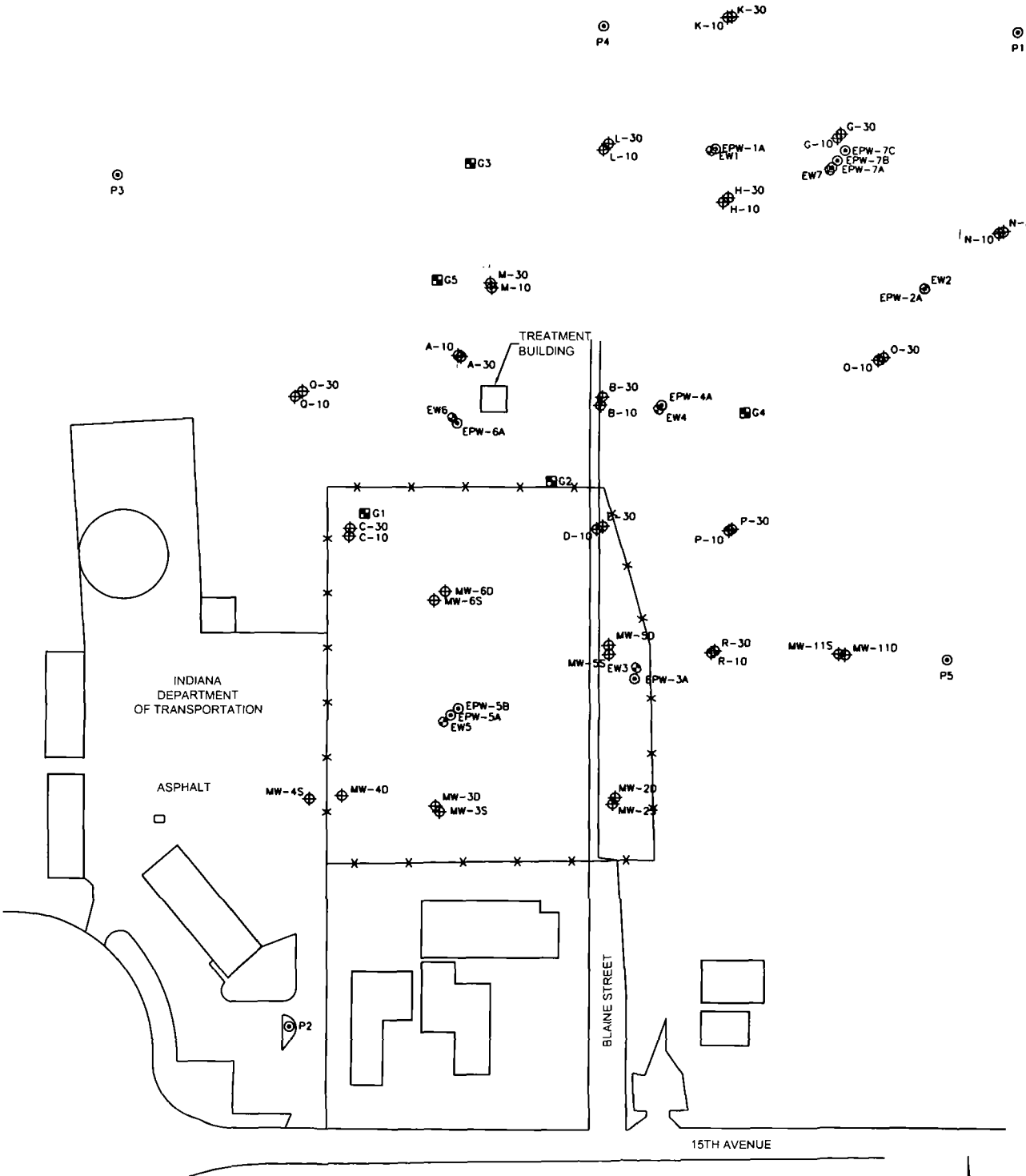


SOURCE: U.S.G.S. 7.5 minute series (topographic)
Highland Quadrangle, Indiana 1991
Whiting Quadrangle, Indiana 1991

CP:\Midco Alternative Remedy\ACAD\Figure 1 Site Location

ENVIRON 740 Waukegan Road, Suite 401, Deerfield, IL 60015	Site Location Map Midco I and II Sites Gary, Indiana	Figure 1

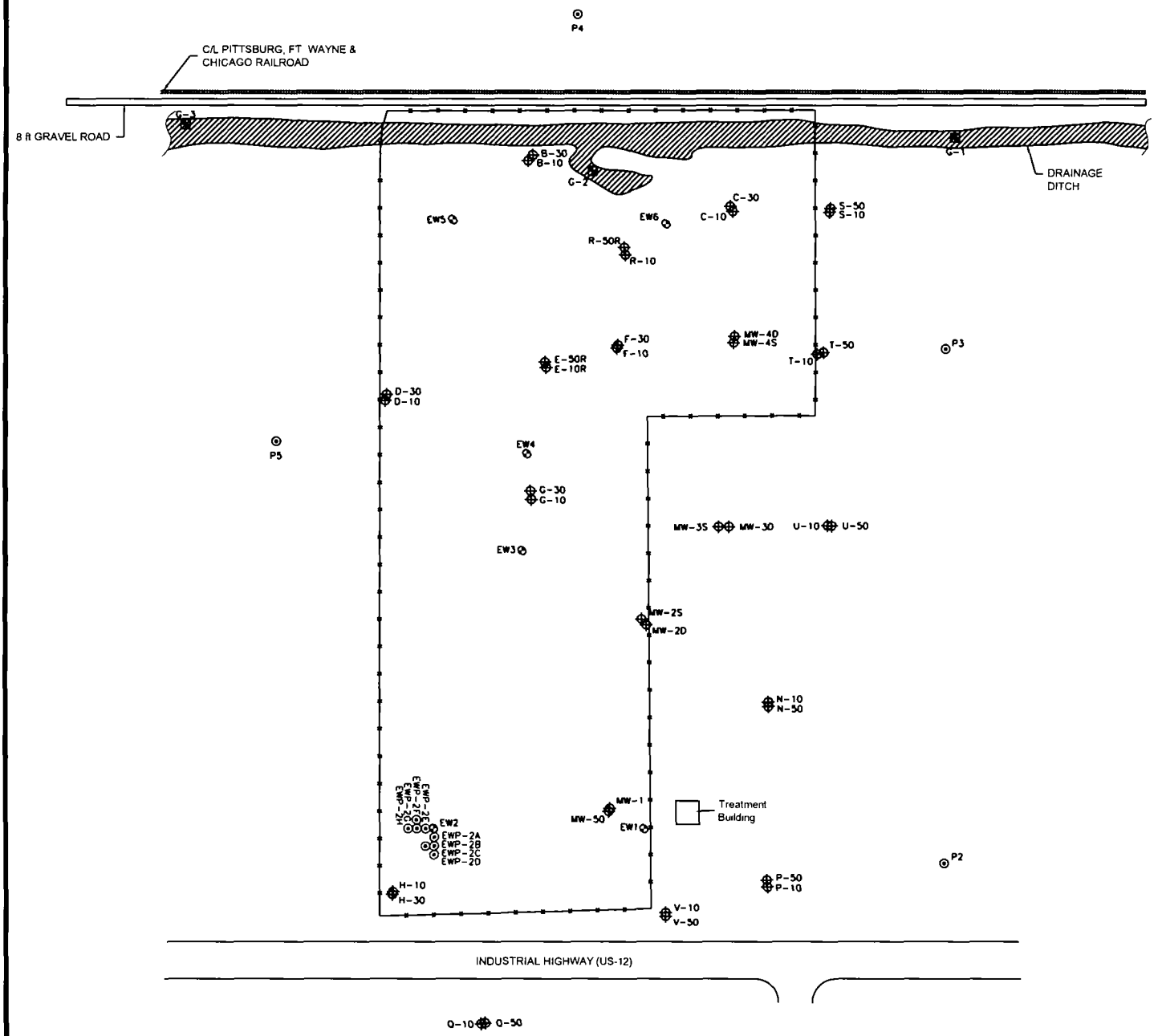
Drafter: CJG Date: 06/28/02 Contract Number: 21-8601W Approved: Revised:



CPF:stMidco Alternate Remedy\ACAD\Midco I Site Layout

ENVIRON 740 Waukegan Road, Suite 401, Deerfield, IL 60015	Midco I Site Layout Gary, Indiana	Figure 2

Drafter: APR	Date: 6/28/02	Contract Number: 21-8601W	Approved:	Revised:	



LEGEND

- Fence
- Extraction Well Location
- Monitoring Well Location
- Piezometer Location
- Staff Gauge Location

NOTE: Pump test observation wells are shown in green.

Extraction well EW-2 is shown in red.

TRUE NORTH SITE NORTH

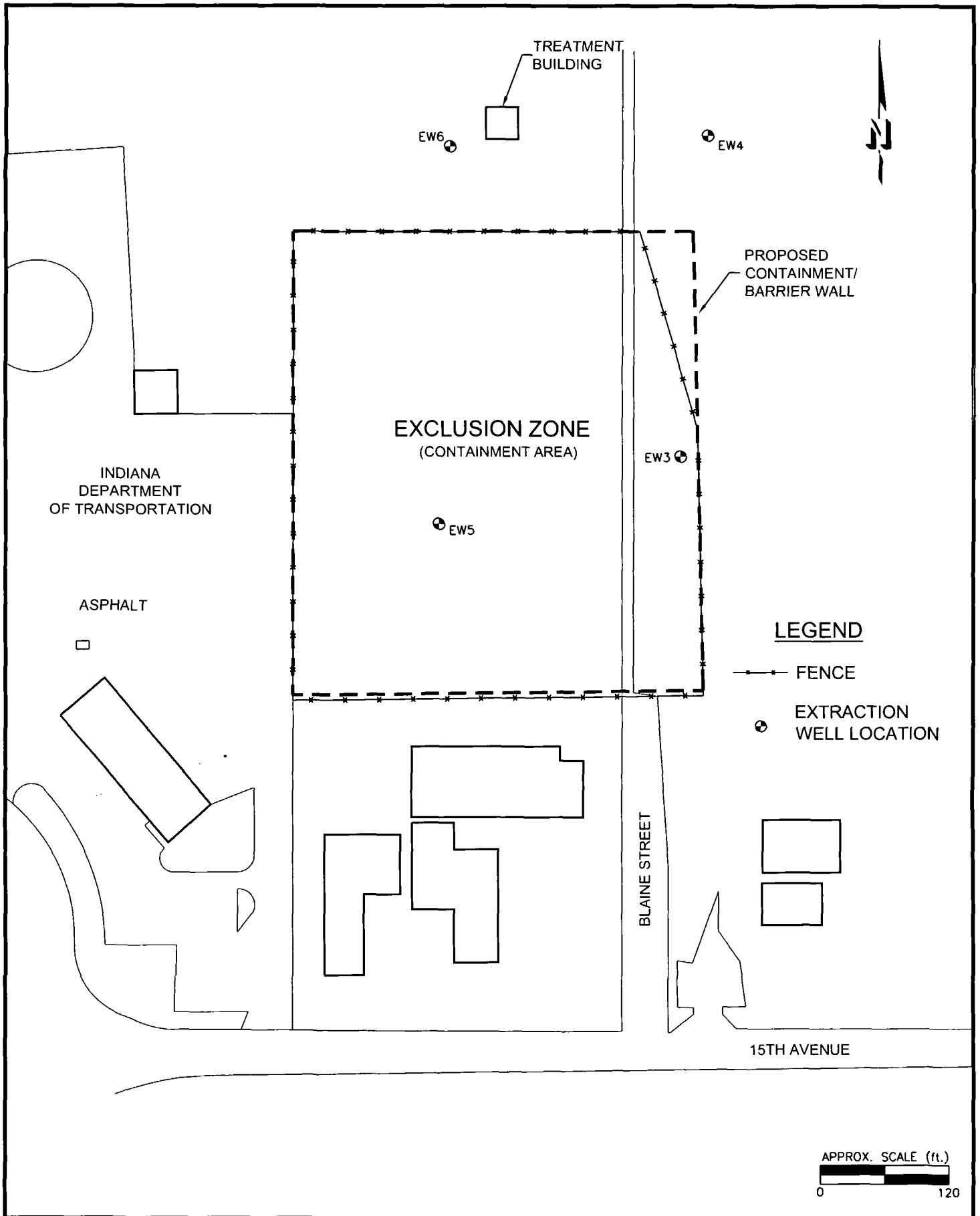
APPROX. SCALE (ft.)

0 200

CPFs\Midco Alternate Remedy\ACAD\Midco II Site Layout

ENVIRON 740 Waukegan Road, Suite 401, Deerfield, IL 60015	Midco II Site Layout Gary, Indiana	Figure 3

Drafter:	APR	Date: 6/28/02	Contract Number:	21-8601W	Approved:	Revised:



CPFs/Midco Alternative Remedy/Acad/Proposed Containment-Barrier Wall Loc

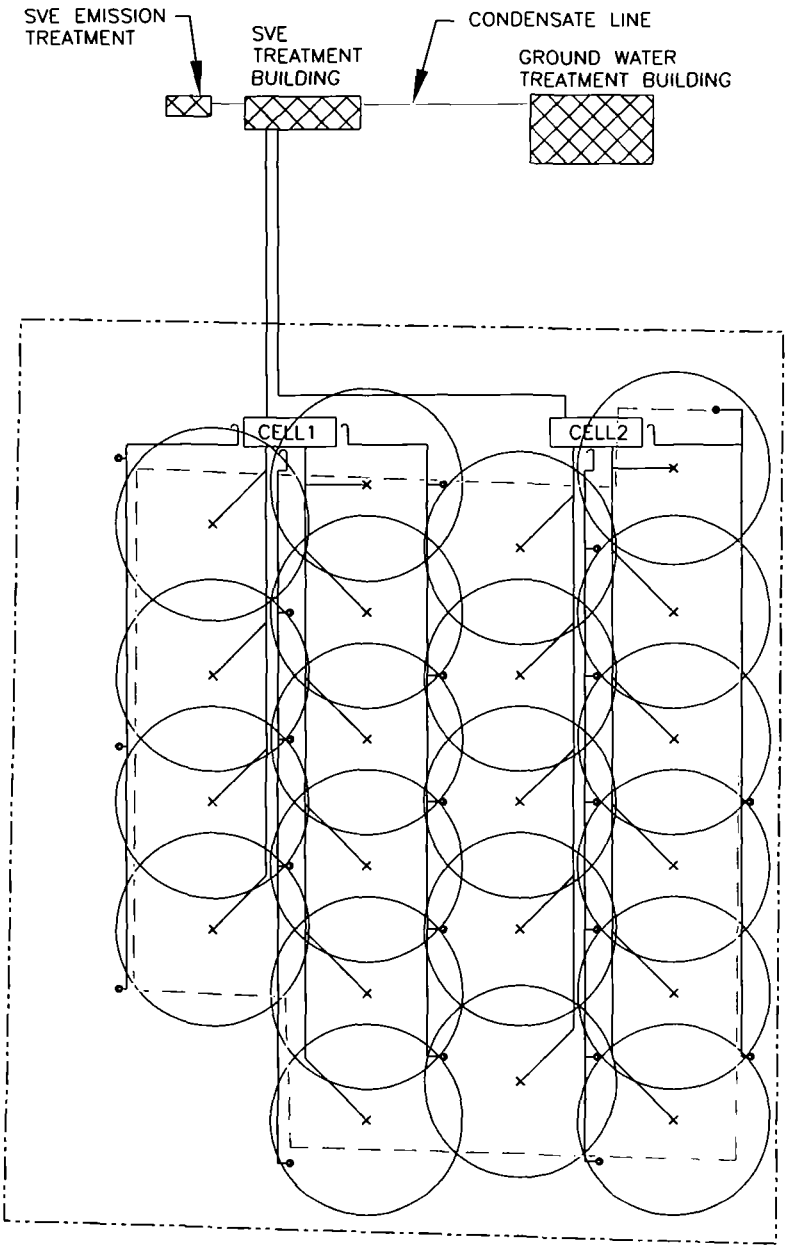
ENVIRON

740 Waukegan Road, Suite 401, Deerfield, IL 60015

Proposed Containment/Barrier Wall Location
Midco I Site
Gary, Indiana

Figure 4

Drafter:	Date:	Contract Number:	Approved:	Revised:
APR	6/28/02	21-8601W		



N
W E
S
SITE NORTH

NOTES:
SVE=SOIL VAPOR EXTRACTION

APPROX. SCALE (ft.)
0 100

SYMBOL LEGEND

- LOCATION OF AIR INLET WELLS
- × LOCATION OF SVE WELLS
- SVE RADIUS OF INFLUENCE
- AIR INLET WELL PIPING
- *SVE PIPING*
- SLURRY WALL
- SOURCE AREA

DRAWN: FKSR
FILE: S:\CPF\ASB\AS810\01\ACAD\SVEAS\FIG2.DWG MAY 10, 2002 - 16:25:01

FIGURE 5

CONCEPTUAL REMEDIAL DESIGN
SVE/BIOVENTING SYSTEM
MIDCO I SITE
GARY, INDIANA

ERM

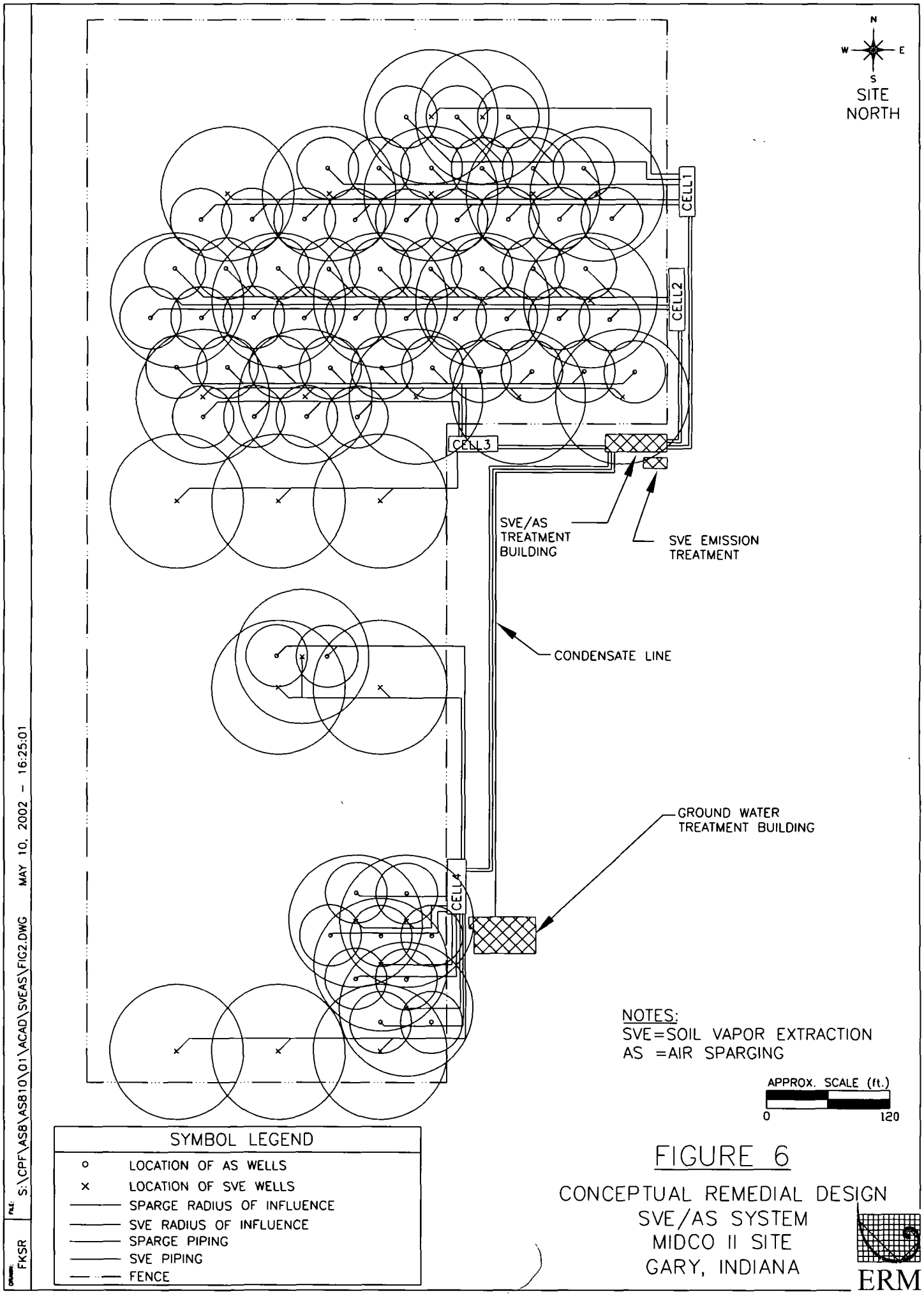


FIGURE 6

CONCEPTUAL REMEDIAL DESIGN
SVE/AS SYSTEM
MIDCO II SITE
GARY, INDIANA

ERM

APPENDIX A

Evaluation of Potential Sources of Metals and
Amenable Cyanide Evaluation

APPENDIX A
EVALUATION OF POTENTIAL SOURCES OF METALS AND AMENABLE CYANIDE EVALUATION

This presents a summary and evaluation of the analytical results of the additional ground water sampling activities conducted at the Midco I and Midco II Sites in March 2002. On behalf of the Midco Remedial Corporation (MRC), Environmental Resources Management, Inc. (ERM), collected ground water samples from four monitoring wells at the Midco I Site, and five monitoring wells and one piezometer at the Midco II Site. The work was performed in general accordance with ERM's letters of March 6 and March 7, 2002 to the United States Environmental Protection Agency (USEPA). Changes to the original scope of work and procedures are described in Section A. The goal of the additional ground water sampling activities was to evaluate the following issues:

- Whether corrosion of the stainless steel monitoring well materials contributes to elevated concentrations of nickel, chromium, and vanadium at the Midco I Site;
- The effect, if any, of suspended solids on the concentration of total metals of concern (i.e., those detected above clean-up action levels [CALs], except for iron) detected in ground water;
- Whether cyanide detected at concentrations above the CALs in certain monitoring wells is free cyanide (i.e., cyanide amenable to chlorination);
- Whether potential off-site upgradient sources of metals (including arsenic) contribute to metals concentrations detected at Midco II; and
- Whether the presence of other metals in ground water samples interferes with the current contract laboratory program (CLP) inductively coupled plasma (ICP) method for arsenic analysis.

The sampling procedures followed during the additional ground water sampling event for the monitoring wells are described in Section 3.3 and Appendix B of the

Remedial Design/Remedial Action Investigation and Monitoring Plan (I&MP), dated May 14, 1993. The corresponding procedures for the piezometer are described in an ERM letter, dated April 13, 2000 as modified in the USEPA's approval letter of April 18, 2000.

The attached Figures A-1 and A-2 show the locations of the monitoring wells and piezometers at the Midco I and Midco II Sites, respectively. Table A-1 summarizes the sampling program followed for the March 2002 investigation. The parameters analyzed included total and dissolved metals, total cyanide, cyanide amenable to chlorination, arsenic, and chloride. Arsenic analytical methods included the CLP ICP method and the newer ICP-mass spectrometry method (ICP-MS).

CompuChem of Cary, North Carolina analyzed the ground water samples in accordance with the approved 1993 Quality Assurance Project Plan (QAPP) as modified in 1996, the procedures for cyanide amenable to chlorination submitted to the USEPA in January 2001, and Method 6020 in USEPA's *Test Methods for the Analysis of Waste-Physical/Chemical Parameters* (SW-846) for arsenic by ICP-MS. Method 6020 is equivalent to the CLP Statement of Work (SOW) ILM05.0, and was used during this evaluation because the USEPA withdrew the ILM05.0 SOW at the end of 2001 and has not issued it in its final form.

A. Scope of Work and Procedure Modifications

During the course of this project, field conditions necessitated several changes in the scope of work and procedures used to conduct the work. The changes are described below.

1. Change In P-4 Sampling

ERM determined during the field measurement activities that the lower 26 feet of piezometer P-4 at the Midco II Site were fouled with tree roots or biological growth. Specifically, the well record for P-4 indicates that the well has a total depth of 58.5 feet; however, the total depth measured during this phase of work was 32.31 feet. Mossy, root-like material was recovered from the bottom of the piezometer. Because the lower portion of the piezometer could not be sampled as specified in

the original scope of work, only a shallow ground water sample (approximately 25 feet below the top of casing) was collected from P-4. An additional monitoring well installed in May 2002 was completed at a depth of 43 feet to serve as a surrogate for this piezometer. This piezometer was designated P-4R.

2. Change In Purging and Sampling Procedures

ERM determined that several of the monitoring wells could not be efficiently purged and sampled using the existing permanent sampling pumps. As such, ground water from those wells was purged and sampled using a peristaltic pump and the low flow sampling procedures approved by the USEPA in an April 18, 2000 letter to Mark Travers.

The following monitoring wells and piezometers were purged and sampled using a peristaltic pump for the reasons stated below:

- P-4, Midco II Site: The piezometer does not have a permanent sampling pump.
- MW-50, Midco II Site: The well does not have a permanent sampling pump because the pump was inoperable and was removed from the well last year.
- S-50, Midco II Site: The permanent sampling pump in this well is inoperable. The pump was leaking at the junction of the drop pipe and the pump handle housing located at the top of the well riser. The cause of the leak appeared to be corrosion of the pumping mechanism.
- MW-6S and G-30, Midco I Site: These wells were sampled as part of the well corrosion evaluation. This evaluation required at least five well volumes (up to 20 gallons) of ground water to be purged using low flow procedures. Therefore, the length of time required to complete the purging at each well justified the use of mechanical equipment instead of the hand-operated permanent sampling pumps.

Monitoring wells C-10 and D-10 at Midco I and H-30, MW-2S, and MW-1 at Midco II were purged and sampled using the permanent well pumps as described in the I&MP.

The following sections present a description of the sampling activities and an evaluation of the sampling results.

B. Field Procedures and Results

The field documentation for the sampling event can be provided upon request. The results of the field measurements are summarized below.

1. Ground Water Elevation Data Collection and Results

The depth to ground water and total depth of each monitoring well and piezometer were measured in accordance with the procedures described in Appendix B of the I&MP and Appendix B of the Operation and Maintenance Plan. The measurements were collected at the Midco I and Midco II Sites on March 12, 2002 and March 13 and March 14, 2002, respectively.

The depths to ground water data for both Sites are presented in Table A-2. These data were obtained only to determine the volume of water in the monitoring well or piezometer, which was used to determine sampling intervals for the corrosion evaluation.

2. Monitoring Well Purging and Sampling Procedures and Results

Monitoring wells C-10 and D-10 at Midco I and H-30, MW-2S, and MW-1 at Midco II were purged using the permanent well pumps and the procedure described in the I & MP. As indicated in Section A.2, monitoring wells MW-6S and G-30 at Midco I and P-4, MW-50 and S-50 at Midco II were purged using a peristaltic pump. The procedure for purging the wells using a peristaltic pump was initiated by placing a length of disposable, 0.25-inch diameter rigid polyethylene tubing into the well to the screened interval or the top of the permanent pump, which blocked the tubing from being inserted further. The permanent pumps for S-50 and G-30

were left in place during purging, so the rigid tubing was inserted through the access port used for water level measurement. Because of refusal of the rigid tubing at the Midco I well MW-6S, the permanent pump was removed from the well, the rigid tubing was inserted, and the pump was replaced into the well prior to purging.

The rigid polyethylene tubing was connected to flexible silicon tubing, which was placed in the pump head. Ground water was purged from the wells at a rate of approximately 0.1 to 0.5 liters per minute. Samples of the purge water were periodically collected for field measurement of pH, temperature, conductivity, and turbidity (the "indicator parameters") as described in the I&MP. Special care was taken during purging so air was not introduced into the samples.

In accordance with Appendix B of the I&MP, ground water samples collected as part of the metal-bearing suspended solids and upgradient, off-site ground water evaluations were obtained after purging the wells or piezometers and achieving stable values for the indicator parameters. Ground water samples collected as part of the corrosion evaluation were obtained after purging 0, 1, 3, and 5 well volumes. Table A-3 summarizes the field data collected at the end of the water stabilization period and prior to obtaining the ground water samples for laboratory analysis for both the Midco I and the Midco II Sites. The laboratory analyses for the metal-bearing suspended solids and upgradient, off-site ground water evaluation are listed in Table A-1. Samples for dissolved metals were filtered in the field using a 0.45-micron filter attached to the sample discharge hose.

Field duplicate samples were collected at a rate of one per every 10 or less investigative samples. Table A-4 presents the procedures used to collect the field blank samples.

C. Well Corrosion Evaluation

Published research has documented that corrosion of stainless steel well materials may contribute to elevated concentrations of nickel, chromium, and vanadium in ground water samples. To evaluate if well corrosion is contributing to the elevated concentrations of nickel and chromium at the Midco I Site, a series of ground water

samples were collected from MW-6S and G-30. These wells were selected for this evaluation because they have historically shown high nickel and chromium concentrations and have a high potential for well corrosion because they share the following properties:

- Have been at the Site for over 16 years,
- Are constructed of 304 or lower-grade stainless steel, and
- Are located in high chloride water that can corrode stainless steel well components.

The wells were purged and sampled using the low flow sampling procedures outlined in Section B. Ground water samples were collected for laboratory analysis of total and dissolved nickel, chromium, and vanadium from the initial ground water purged from the well and after one, three, and five well volumes of ground water had been purged from the wells.

In theory, if well corrosion is contributing to the elevated metals concentrations, the initial sample should have the highest total and dissolved metals concentrations and each successive sample should show decreasing concentrations. The sampling procedure and evaluation is based on the information provided in *Nickel and Chromium in Ground water Samples as Influenced by Well Construction and Sampling Methods* (D. Oakley and N. E. Korte, Ground Water Monitoring and Remediation, Winter 1996, pp. 93-99).

The analytical results for total and dissolved metals are summarized in Table A-5. Figures A-3 and A-4 show the trends of total nickel, chromium, and vanadium concentrations in relation to the sample and purging sequence for the Midco I Site wells G-30 and MW-6S, respectively. Figure A-3 shows an increase in the concentration of nickel and a decrease in the concentrations of chromium and vanadium over the purge period for G-30. Figure A-4 shows a decrease in nickel and chromium concentrations and relatively steady concentrations of vanadium over the purge period for MW-6S.

The analytical results for dissolved nickel, chromium, and vanadium over the purge period for G-30 and MW-6S are shown in Figures A-5 and A-6, respectively. Figure A-5

shows an initial increase in dissolved nickel, chromium and vanadium concentrations and a subsequent decrease in concentrations as water is purged from G-30. Figure A-6 shows a decrease in dissolved nickel concentration and a slight increase in the concentration of dissolved chromium and vanadium over the purge period for MW-6S. In most cases, there was a reduction in concentrations between the analytical results of the samples collected after three and five purged well volumes, which may have continued if purging had proceeded.

The results of the well corrosion evaluation suggest that well corrosion may be contributing to the elevated concentrations of nickel, chromium, and vanadium in the ground water at the Midco II Site; however, the data are not sufficient to show that corrosion alone causes exceedances of the CALs. The variability in the results suggests that other sources of nickel, chromium and vanadium may be impacting the ground water. Based on nickel concentration trends and field observations of potential biofouling in MW-6S, ERM recommends replacing this well with a new, higher-grade stainless steel monitoring well if this well is to be monitored in the future. If necessary, further evaluation could be performed at monitoring well G-30 based on the dissolved nickel results.

D. Metal-Bearing Suspended Solids Evaluation

To evaluate whether metal-bearing suspended solids are the source of elevated metals concentrations in ground water at the Midco Sites, ground water samples were collected for total and dissolved arsenic, barium, chromium, copper, manganese, nickel, and vanadium (the "select metals") using the low flow sampling procedures outlined in Section B. The ground water samples were obtained following stabilization of indicator parameters at MW-6S and G-30 at the Midco I Site and S-50, MW-50, H-30, MW-1, and P-4 at the Midco II Site. If metals-bearing suspended solids are the source of elevated metals concentrations in ground water, the concentration of dissolved metals should be consistently lower than concentrations of total metals. There should also be a good correlation between turbidity and total metals concentration.

The analytical results for the total and dissolved metals analysis are shown in Tables A-6 and A-7, respectively. Tables A-6 and A-7 also present a comparison of the

analytical results to CALs established for the Midco I and Midco II Sites. Figures A-7 through A-14 compare the analytical results of total vs. dissolved arsenic by CLP-ICP, barium, chromium, copper, manganese, nickel, vanadium, and arsenic by ICP-MS.

The comparison of total vs. dissolved metals shows that the concentration of total arsenic by ICP, barium, and nickel are similar (variation within an acceptable duplicate difference of 20 to 30 percent) to the corresponding dissolved concentrations at each of the monitoring location samples. Some of the dissolved metals concentrations were higher than the corresponding total metals concentrations (e.g., nickel at G-30 in Figure A-13). Differences greater than 30 percent for these analyses are of concern, but do not indicate that the presence of suspended solids increases the detected total concentrations.

As shown in Figures A-9 through A-12, the concentrations of total chromium, copper, manganese, and vanadium were much higher than the corresponding dissolved concentrations at monitoring well H-30 at the Midco II Site. In addition, the concentration of total copper is approximately five times greater than the concentration of dissolved copper at MW-6S. The results for monitoring wells H-30 and MW-6S appear to be related to the presence of turbidity in the samples at levels higher than about 9 Nephelometric turbidity units (NTU). Finally, the concentration of total arsenic by ICP is 40 percent greater than the concentration of dissolved arsenic by ICP at S-50, but may be unrelated to the suspended solids evaluation because the turbidity of the sample was low (i.e., 3.2 NTU).

The metals-bearing solids evaluation results suggest that the concentration of arsenic, barium, and nickel in ground water are not greatly influenced by suspended solids, even at sample location H-30 at the Midco II Site, where the sample turbidity was measured at 92.2 NTUs. However, the difference in total and dissolved chromium, copper, manganese, and vanadium at H-30 indicates the concentration of these analytes is influenced by sample turbidity. As a result, ERM recommends collecting filtered ground water samples for metals analysis at monitoring well locations where turbidity measurements are greater than 5 NTU.

E. Off-Site, Upgradient Metal Sources Evaluation

To evaluate if the elevated concentrations of metals detected at the Midco II Site are from upgradient off-site sources, a shallow ground water sample was collected at the upgradient piezometer P-4, and a deep ground water sample was obtained later from the new monitoring well P-4R. ERM had originally proposed to collect one shallow and one deep sample from P-4. However, as indicated in Section A.1, only one ground water sample representative of shallow ground water conditions was obtained at this location. The shallow ground water sample from P-4 was analyzed for select total and dissolved metals, total and dissolved arsenic by ICP-MS, and chloride (see Table A-1).

The analytical results of the shallow sample obtained from P-4 were compared to the 2002 analytical results for total and dissolved metals at MW-1 and the 2001 analytical results for total metals at C-10, R-10, and S-10. These wells are completed in the shallow portion of the aquifer and are downgradient of P-4.

As shown on Table A-8, the concentration of total and dissolved arsenic, barium, and copper were detected at slightly higher concentrations at P-4 than MW-1. However, the difference in concentration is only a few parts per billion and the results are within 66 to 84 percent of each other. The concentrations of all total metals analyzed at P-4 are lower than the concentrations detected at C-10 and R-10. The concentrations of barium and manganese detected at P-4 are higher than concentrations detected at S-10 in 2001.

The results of the off-site source evaluation indicate that the concentrations of metals in shallow ground water at P-4 are similar to or lower than the concentrations of metals detected at MW-1, C-10 and R-10. The higher concentration of total barium and manganese detected at P-4 suggests the potential for an upgradient off-site source of these compounds at S-10. However, the concentrations detected at both P-4 and S-10 are well below the site-specific CALs. Based on this information, it does not appear that the shallow, off-site upgradient ground water is a significant source of the elevated concentrations of metals detected in the shallow ground water at the Midco II Site.

F. Arsenic Evaluation

To determine if other metals present in ground water samples at the Midco I and Midco II Sites interfere with the CLP-ICP method of arsenic analysis, ground water

samples were collected from H-30, MW-1, MW-50, P-4, and S-50 for laboratory analysis of total and dissolved arsenic using the CLP-ICP and the newer ICP-MS method, which eliminates the potential interference from other metals, such as aluminum and iron.

The analytical results, summarized in Table A-5 and shown on Figures A-15 and A-16 do not show a specific trend (i.e., consistently higher or lower) in the concentration of arsenic using the different analytical methods. However, the detection limits achieved by using the ICP-MS method are much higher than those achieved by using the ICP method. According to the laboratory, the high concentrations of calcium and magnesium coated the emitting source in the instrument. Therefore, the samples were diluted by a factor of 40.

The largest difference between the analytical methods is 33.2 ug/L in the total arsenic concentration obtained for the samples from S-50, but the concentrations in the total arsenic analysis by ICP-MS was suspect because it was much higher than the dissolved arsenic results without the sample having a high turbidity. Therefore, it appears that other metals present in ground water at the Midco II Site do not interfere with the CLP-ICP analytical method. In addition, the calcium and magnesium concentrations present in the ground water result in a detection limit higher than the current drinking water maximum contaminant level (MCL); therefore, the ICP-MS method cannot meet the detection limit requirements for the Midco II ground water samples, and should not be used at the Site.

G. Amenable Cyanide Evaluation

Two of the Midco I monitoring wells (C-10 and D-10) and two of the Midco II monitoring wells (MW-1 and MW-2S) contained cyanide in the 2001 annual ground water samples above one or more of: (1) the MCL of 200 ug/L, (2) the corresponding site-specific fresh water ambient water quality criterion (AWQC), and (3) the site-specific background concentration. Cyanide amenable to chlorination is toxic to humans at low levels, whereas complexed cyanide is not as toxic. The source of cyanide at C-10, G-30, and H-30 at the Midco I Site is believed to be complexed cyanide ferric salts from the neighboring Indiana Department of Transportation property. Monitoring well D-10 at the Midco I Site can be used to test ground water potentially impacted by other sources of

cyanide. The specific type of cyanide in the source that generated the cyanide detected at the Midco II Site monitoring wells MW-1 and MW-2S is unknown.

To evaluate the type of cyanide present in ground water at the Sites, samples were collected for laboratory analysis of total cyanide and amenable cyanide from C-10, D-10, and G-30 at the Midco I Site and from MW-1 and MW-2S at the Midco II Site. The analytical results summarized in Table A-6 show that amenable cyanide was not detected in wells G-30 at the Midco I Site or MW-2S at the Midco II Site. However, it was detected in the other three wells as follows:

- Below the CALs at the Midco I well D-10.
- Above the site-specific AWQC of 20.3 ug/L at the Midco I Site well C-10, and
- Above both the MCL and the site-specific background concentration at the Midco II well MW-1.

Several of the wells that contained total cyanide at concentrations higher than the CALs show amenable cyanide concentrations below the CALs, indicating that the ground water in those areas does not pose a threat to human health and the environment. Nonetheless, the results also show that some locations have amenable cyanide concentrations exceeding the CALs and those locations have to be addressed. Given that amenable cyanide is the most toxic form of cyanide and it is the form regulated in the State of Indiana, the ground water samples from locations that have shown cyanide above the CALs in the past, or that are downgradient from the wells sampled for cyanide during this investigation should be analyzed for only amenable cyanide. Those locations include:

- Past occurrences of cyanide above the CALs in the past: C-10, D-10, and G-30 at the Midco I Site and MW-1 and MW-2S at the Midco II Site.
- Downgradient locations: K-10, K-30, and P-1 at the Midco I Site and V-10, V-50, and P-1 at the Midco II Site.

Finally, the laboratory reported that upon chlorination, significantly higher concentrations of total cyanide were detected in one of the two samples submitted for cyanide analyses from the Midco I well G-30. The second sample showed essentially no difference in the total cyanide concentrations before and after chlorination. Although the analysis indicates no amenable cyanide present and inconsistency in the results between the two samples collected, chlorination of the ground water at this location should be avoided.

H. Summary of Results

The results obtained from this additional ground water investigation can be summarized as follows:

- *Well Corrosion Evaluation:* Corrosion of well materials may be a contributing source of nickel, chromium, and vanadium at the Sites, but the data are insufficient to show that corrosion alone is responsible for exceedances of the CALs. Moreover, the results suggest that other sources of nickel, chromium and vanadium are likely present at the Sites. Additional evaluation of selected monitoring wells would be required to determine whether corrosion alone is responsible for the exceedance of the CALs. Potential biofouling and reduction of dissolved nickel concentrations observed at the Midco I well MW-6S indicate that this well should be replaced if it is to be monitored in the future.
- *Metal-Bearing Suspended Solids Evaluation:* The results indicate that higher turbidity samples have higher concentrations of chromium, copper, manganese, and vanadium; therefore, ERM recommends filtering ground water samples with turbidity higher than approximately 9 NTU.
- *Off-site, Upgradient Metal Sources Evaluation:* The constituent concentrations found in the shallow sample from P-4 and P-4R were at levels similar to or less than the constituent concentrations detected in downgradient wells; therefore,

the off-site, upgradient ground water is not a major contributor to the elevated metals concentrations detected in the shallow ground water at the Midco II Site.

- *Arsenic Evaluation:* Other metals present in the ground water at the Midco II Site do not interfere with the arsenic analysis by CLP-ICP. The need to dilute the samples to eliminate the interference from calcium and magnesium when using the ICP-MS method raises the detection limit for arsenic to a level above its MCL; therefore, the ICP-MS method cannot achieve the required detection limits for ground water at the Midco II site.
- *Amenable Cyanide Evaluation:* Amenable cyanide was not found at well G-30 at the Midco I Site or well MW-2S at the Midco II Site. However, it was found in the other three wells that contained total cyanide above the CALs in the 2001 annual ground water monitoring samples as follows:

    - D-10 at the Midco I Site: Below the CALs.
    - C-10 at the Midco I Site: Above the site-specific AWQC.
    - MW-1 at the Midco II Site: above the MCL and the site-specific background concentration.

Because several of the wells that contained total cyanide at concentration higher than the CALs show amenable cyanide concentrations below the CALs and thus, no impact on human health, ERM recommends evaluating cyanide contamination using amenable cyanide at those locations that have shown cyanide levels above the CALs in the past or at corresponding downgradient locations. Nonetheless, the results also show that some locations have amenable cyanide concentrations exceeding the CALs and those locations have to be addressed.

In addition, we recommend avoiding chlorination of well G-30 at the Midco I Site because when done during the cyanide analysis, it resulted in significantly higher total cyanide concentrations in one of the two samples collected from the same well, although amenable cyanide was still not detected in either sample.

TABLE A-1
SAMPLING PROGRAM
MARCH 2002 GROUND WATER SAMPLES
MIDCO I AND MIDCO II SITES, GARY, INDIANA

Site	Sampling Location	Purge Volume [1]	Ni, Cr, V		As, Ba, Cr, Cu, Mn, Ni, V		Cl	As (ICP-MS)		CN	
			Filtered	Total	Filtered	Total	Total	Filtered	Total	Amenable	Total
Midco I	MW-6S	0	1	1			1				
		1	1	1			1				
		3			1	1	1				
		5	1	1			1				
	G-30	0	1	1			1				
		1	1	1			1				
		3			1	1	1			1	1
		5	1	1			1				
	D-10	3								1	1
	C-10	3								1	1
Midco II	MW-1	3			1	1	1	1	1	1	1
	MW-50	3			1	1	1	1	1		
	S-50	3			1	1	1	1	1		
	H-30	3			1	1	1	1	1		
	P-4 (shallow)	3			1	1	1	1	1		
	P-4 (deep)	3			1	1	1	1	1		
	MW-2S	3								1	1
	Investigative Total		6	6	8	8	14	6	6	5	5
	Field Duplicate		1	1	1	1	1	1	1	1	1
	Field Blank		1	1	1	1	1	1	1	1	1
	Matrix Spike					1			1		
TOTAL SAMPLES			8	8	10	11	16	8	9	7	7

Key:

Cl = Chloride
CN = Cyanide
ICP - MS = Inductively-coupled plasma - Mass spectrometry
Purge volume = Number of well volumes of water purged

[1] The "3" purge volume sample will be collected after stabilization of field parameters or after 3 well volumes are purged, whichever occurs later, in accordance with the Midco Investigation and Monitoring Plan. If the "3" purge volume sample was collected beyond 3 well volumes, two additional well volumes will be purged before collecting the "5" purge volume sample.

TABLE A-2

WATER LEVELS AND PIEZOMETRIC SURFACE FOR MARCH 2002 [1]

MIDCO I AND MIDCO II SITES, GARY, INDIANA

Monitoring Location	*Top of Casing Elevation (feet)*	*Depth to Water (feet)*	*Screen Midpoint Elevation (feet)*	*Water Temperature deg C*	*Water Density (g/mL)*	*Density Correction Factor*	*Corrected Water Density (g/mL)*	*Water Table Elevation (feet above MSL)*	*Piezometric Surface Elevation (feet above MSL)*
Midco I									
Shallow Monitoring Wells									
MW-6S	601.64	1.36	595.640					600.280	
C-10	603.47	3.70	594.980					599.770	
D-10	602.75	3.87	593.710					598.880	
Deep Monitoring Wells									
G-30	599.91	4.60	573.490					595.310	
Midco II									
Piezometers									
P-4	610.66	20.95	565.20					589.710	
Shallow Monitoring Wells									
MW-1	594.87	6.41	583.28					588.460	
MW-2S	594.88	6.33	582.66					588.550	
Deep Monitoring Wells									
MW-50	595.16	6.55	551.09					588.610	
H-30	594.19	5.90	550.62					588.290	
S-50	595.69	6.37	554.35					589.320	

[1] Blank spaces indicate either that the measurement was not taken during the March 2002 sampling event.

TABLE A-3

2002 ADDITIONAL GROUND WATER SAMPLING FINAL STABILIZATION DATA
MIDCO I AND MIDCO II SITES, GARY, INDIANA

Well Number	*Cumulative Volume (gallons)*	*pH (units)*	*Conductance (umhos/cm)*	*Temperature (° C)*	*Turbidity (NTU)*
Midco I					
MW-6S[1]	4.7	7.17	17,110	9.9	9.26
C-10	4.5	7.32	1,351	8.0	19.9
D-10	3.5	6.77	1,057	7.8	2.2
G-30[1]	13	7.18	26,130	12.4	0.53
Midco II					
P-4	5.5	7.25	2,387	11.5	0.2
MW-1	3	7.12	1,051	9.5	1.4
MW-50	19.75	8.01	40	12.5	7.8
MW-2S	3	7.48	1,479	8.7	1.1
H-30	19	7.95	59,290	12.9	92.2
S-50	17.5	7.44	60,910	11.8	3.2

Key:

NTU = Nephelometric turbidity units

[1] Data collected at 3 well volumes.

TABLE A-4
FIELD BLANK LOCATIONS AND SAMPLING PROCEDURES
MIDCO I AND MIDCO II SITES, GARY, INDIANA

Parameter	*Location*	*Procedure*
Total Metals	G-30	Pump laboratory-supplies water through the peristaltic pump tubing.
Dissolved Metals	G-30	Same as above, but pumped through new 0.45-micron filter.
Total and Amenable Cyanide	C-10	Pour laboratory-supplies water over a decontaminated water level meter probe.
Total Arsenic	P-4	Same as for total metals.
Dissolved Arsenic	P-4	Same as for dissolved metals.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR MARCH 2002 GROUND WATER DATA [1]
MIDCO I AND MIDCO II SITES, GARY, INDIANA
(Page 1 of 2)

	Midco I Site									
	C-10	D-10	G-30				MW-6S			
Sample ID:	1WC10AE	1WD10AE	1WG30AE0	1WG30AE1	1WG30AE3	1WG30AE5 [2]	1WMW6SAE0	1WMW6SAE1	1WMW6SAE3	1WMW6SAE5
Collection Date:	3/13/02	3/13/02	3/14/02	3/14/02	3/14/02	3/14/02	3/14/02	3/14/02	3/14/02	3/14/02
Receipt Date:	3/14/02	3/14/02	3/15/02	3/15/02	3/15/02	3/15/02	3/15/02	3/15/02	3/15/02	3/15/02
Analyte										
Dissolved Metals										
Arsenic by ICP					11.7				11.2	
Barium					1,850				112 B	
Chromium			0.9 U	46.1	71.8	47	158	259	274	268
Copper					3.9 B				5.5 B	
Manganese					108				446	
Nickel			1 U	480	1,470	1,130	2,400	1,790	1,620	1,630
Vanadium			1.7 U	220	144	142	12.6 B	18.5 B	25.2 B	29.2 B
Total metals										
Arsenic by ICP					7.4 B				5.7 B	
Barium					1,800				117 B	
Chromium			92.5	43.7	42	42.5	310	274	279	240
Copper					2.8 B				25.2	
Manganese					24.9				459	
Nickel			480	1,090	1,060	1,070	16,200	3,360	1,964	1,850
Vanadium			233	139	134	136	22.6 B	18.2 B	26.7 B	25.9 B
Arsenic by ICP-MS, dissolved										
Arsenic by ICP-MS, total										
Chloride, mg/L			4,560	8,920	8,340	8,530	6,650	6,430	4,620	3,880
Cyanide, total	941	30.4			66.4					
Cyanide, amenable	98.3	9.6 B			0.8 U					

Key:
U = Analyte was analyzed for but not detected above the detection limit shown
B = The analyte was detected below the contract-required detection limit, but above the instrument detection limit

[1] All units in ug/L, except chloride (as shown)
[2] The result shown is the highest detected or the lowest detection limit achieved between the sample and its duplicate(s).

TABLE A-6

COMPARISON OF MARCH 2002 TOTAL INORGANIC ANALYTICAL RESULTS TO CALS[1]

MIDCO I AND MIDCO II SITES, GARY, INDIANA

	Midco I				*Midco II*							
	C-10	*D-10*	*G-30*	*MW-6S*	*H-30*	*MW-1*	*MW-50*	*MW-2S*[2]	*P-4*	*S-50*	*Parameter-specific CAL*	
Sample ID:	1WC10AE	1WD10AE	1WG30AE3	1WMW6SAE3	2WH30AE[2]	2WMW1AE[2]	2WMW50AE	2WMW2SAE	2WP4AE	2WS50AE		
Collection Date:	3/13/02	3/13/02	3/14/02	3/14/02	3/12/02	3/12/02	3/12/02	3/12/02	3/13/02	3/13/02		
Receipt Date:	3/14/02	3/14/02	3/15/02	3/15/02	3/13/02	3/13/02	3/13/02	3/13/02	3/14/02	3/14/02		
Analyte											*Midco I*	*Midco II*
Total metals												
Arsenic by ICP			7.4 B	5.7 B	49	1.7 U	50.5		5.5 B	91.8	6	15.1
Barium			1,800	117 B	2,000	60.2 B	7,400		75.1 B	2,710	1,620	1,620
Chromium			42	279	361	2.2 B	0.9 U		0.9 U	0.9 U	100	100
Copper			2.8 B	25.2	24.9 B	2.7 B	1.8 U		1.8 U	1.8 U	50.7	120
Manganese			24.9	459	1,390	750	221		299	42.2	6,470	6,470
Nickel			1,060	1,964	179	31.6 B	2.9 B		1 U	4.8 B	647	647
Vanadium			134	26.7 B	21.6 B	1.7 U	1.7 U		1.7 U	1.7 U	227	227
Arsenic by ICP-MS, Total					47.6	13.6 U	47.7		13.6 U	125	6	15.1
Chloride, mg/L			8,340	4,620	20,700	45	14,200		393	21,600		
Cyanide, total	941	30.4	66.4			17,651		47.3			20.3	158
Cyanide, amenable	98.3	9.6 B	0.8 U			3,400		0.8 U			20.3	158

Key:

U = Analyte was analyzed for but not detected above the detection limit shown

B = The analyte was detected below the contract-required detection limit, but above the instrument detection limit

CAL = Clean-up Action Level, calculated as if the parameter was the only carcinogen or non-carcinogen detected in the sample

[ ] Concentration shown is above the CAL

[1] All units in ug/L, except chloride (as shown).

[2] The result shown is the highest detected or the lowest detection limit achieved between the sample and its duplicate(s).

TABLE A-7

COMPARISON OF MARCH 2002 DISSOLVED INORGANIC ANALYTICAL RESULTS TO CALS [1]

MIDCO I AND MIDCO II SITES, GARY, INDIANA

	Midco I		*Midco II*						
	G-30	*MW-6S*	*H-30*	*MW-1*	*MW-50*	*P-4*	*S-50*	*Parameter-specific CAL*	
Sample ID:	*1WG30AE3*	*1WMW6SAE3*	*2WH30AE* [2]	*2WMW1AE* [2]	*2WMW50AE*	*2WP4AE*	*2WS50AE*		
Collection Date:	*3/14/02*	*3/14/02*	*3/12/02*	*3/12/02*	*3/12/02*	*3/13/02*	*3/13/02*		
Receipt Date:	*3/15/02*	*3/15/02*	*3/13/02*	*3/13/02*	*3/13/02*	*3/14/02*	*3/14/02*	*Midco I*	*Midco II*
Analyte									
Dissolved Metals									
Arsenic by ICP	11.7	11.2	38.3	5.3 B	53.4	8 B	96	6	15.1
Barium	1,850	112 B	2,070	64 B	7,710	76 B	2,510	1,620	1,620
Chromium	71.8	274	4 B	0.9 U	0.9 U	0.9 U	1.1 B	100	100
Copper	3.9 B	5.5 B	2.5 U	1.9 B	1.8 U	2.6 B	1.8 U	50.7	120
Manganese	108	446	61.4	793	229	305	42.9	6,470	6,470
Nickel	1,470	1,620	25.7 B	25.8 B	1.2 B	1 U	5.8 B	647	647
Vanadium	144	25.2 B	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	227	227
Arsenic by ICP-MS, dissolved			46.7	13.6 U	47	13.6 U	78.4	6	15.1

Key:

U = Analyte was analyzed for but not detected above the detection limit shown

B = The analyte was detected below the contract-required detection limit, but above the instrument detection limit

CAL = Clean-up Action Level, calculated as if the parameter was the only carcinogen or non-carcinogen detected in the sample

[ ] Concentration shown is above the CAL

[1] All units in ug/L, except chloride (as shown).

[2] The result shown is the highest detected or the lowest detection limit achieved between the sample and its duplicate(s).

TABLE A-8

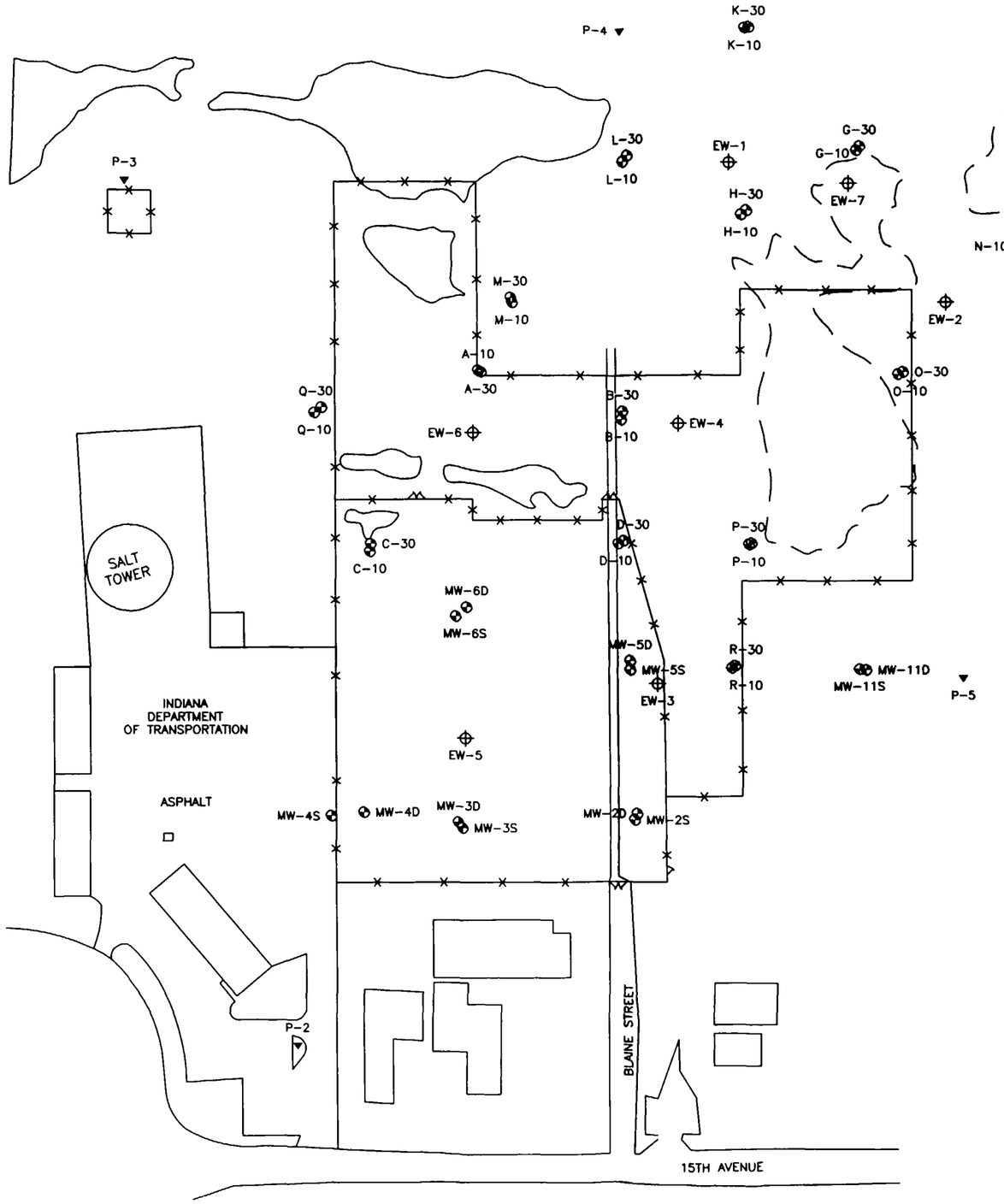
SUMMARY OF RELEVANT MIDCO II SITE SHALLOW GROUND WATER CONCENTRATIONS[1]
UPGRADIENT OFF-SITE METAL SOURCE INVESTIGATION
MIDCO II SITE, GARY, INDIANA

	2002 Ground Water Samples		2001 Annual Ground Water Monitoring		
	P-4	MW-1	S-10	C-10	R-10
Sample ID:	2WP4AE	2WMW1AE [2]	2WS1006	2WC1006	2WR1006
Collection Date:	3/13/02	3/12/02	5/21/01	5/22/01	5/23/01
Receipt Date:	3/14/02	3/13/02	5/22/01	5/23/01	5/24/01
Analyte					
Dissolved Metals					
Arsenic by ICP	8 B	5.3 B			
Barium	76 B	64 B			
Chromium	0.9 U	0.9 U			
Copper	2.6 B	1.9 B			
Manganese	305	793			
Nickel	1 U	25.8 B			
Vanadium	1.7 U	1.7 U			
Total metals					
Arsenic by ICP	5.5 B	1.7 U	23.5	48.9	19
Barium	75.1 B	60.2 B	25	626	161
Chromium	0.9 U	2.2 B	129	4.6 J	7.2 J
Copper	1.8 U	2.7 B	15.9	4.2 J	11.7 J
Manganese	299	750	128	1,670	1,980
Nickel	1 U	31.6 B	52.3	4.8 J	516
Vanadium	1.7 U	1.7 U	53.5	3.2 U	4.6
Arsenic by ICP-MS, dissolved	13.6 U	13.6 U			
Arsenic by ICP-MS, total	13.6 U	13.6 U			
Chloride, mg/L	393	45			
Cyanide, total		17,651			
Cyanide, amenable		3,400			

Key:
U = The analyte was analyzed for but not detected above the detection limit shown
B = The analyte was detected below the contract-required detection limit, but above the instrument detection limit
J = Quantitation is approximate due to limitations identifie during the quality assurance review (data validation)

[1] All units in ug/L, except chloride (as shown).

[2] The result shown is the highest detected or the lowest detection limit achieved between the sample and its duplicate(s).



APPROX. SCALE (ft.)
0 150

SYMBOL LEGEND

- FENCE
- MONITORING WELL LOCATION
- PIEZOMETER LOCATION
- EXTRACTION WELL LOCATION
- SURFACE WATER BODY, DASHED LINE WHERE INTERMITTENT

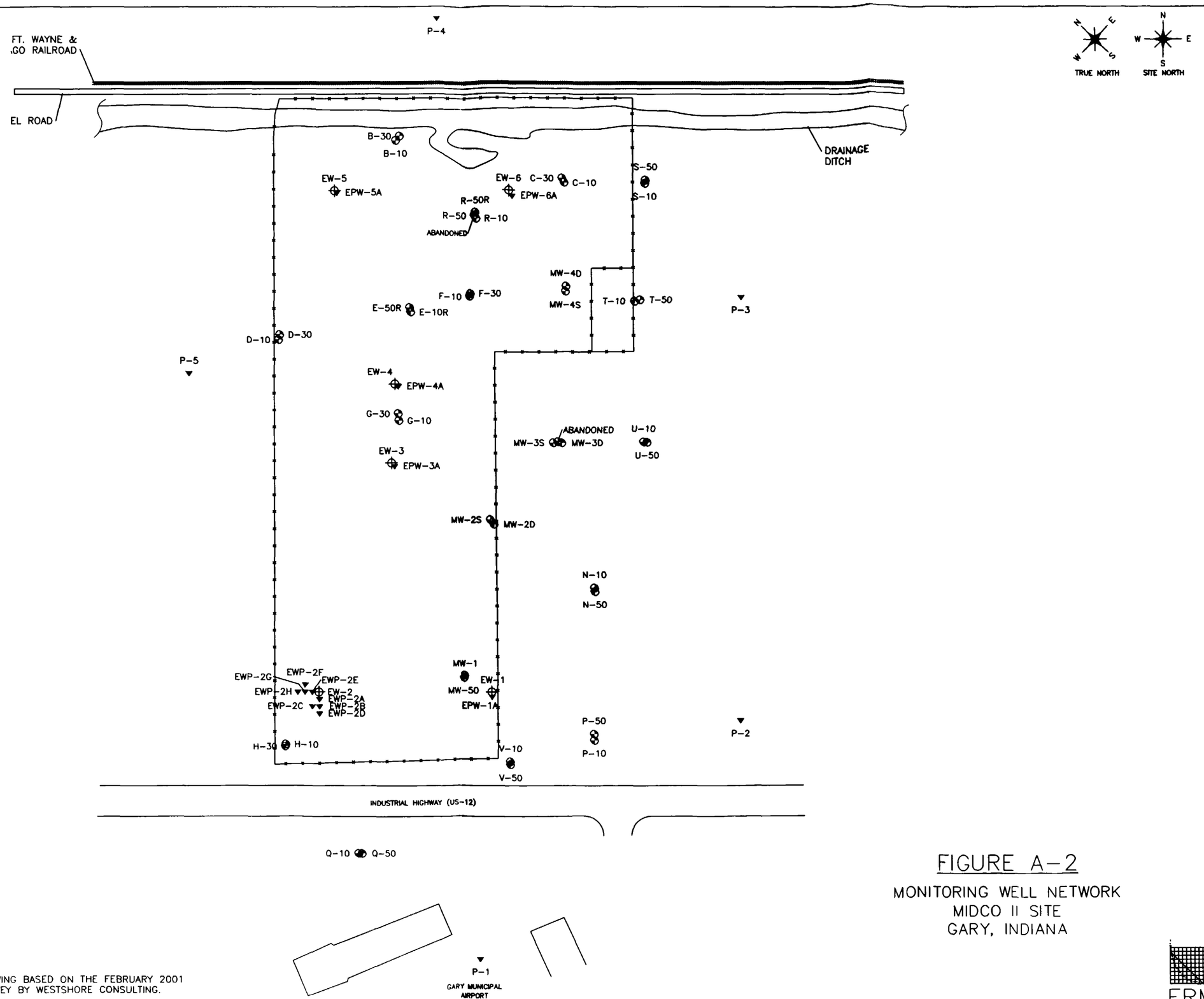
NOTE.
1. DRAWING BASED ON THE JULY, 1992 AND THE FEBRUARY/MARCH, 1993 SURVEYS BY WESTSHORE ENGINEERING AND SURVEYING, INC.

FIGURE A-1

MONITORING WELL NETWORK
MIDCO I SITE
GARY, INDIANA

ERM

FILE: S:\CPF\AS6\AS810\01\ACAD\RPT2001\FIGA-1.DWG JULY 12, 2002 - 08:50:48
DRAWN: FK



NOTE:
1. DRAWING BASED ON THE FEBRUARY 2001 SURVEY BY WESTSHORE CONSULTING.

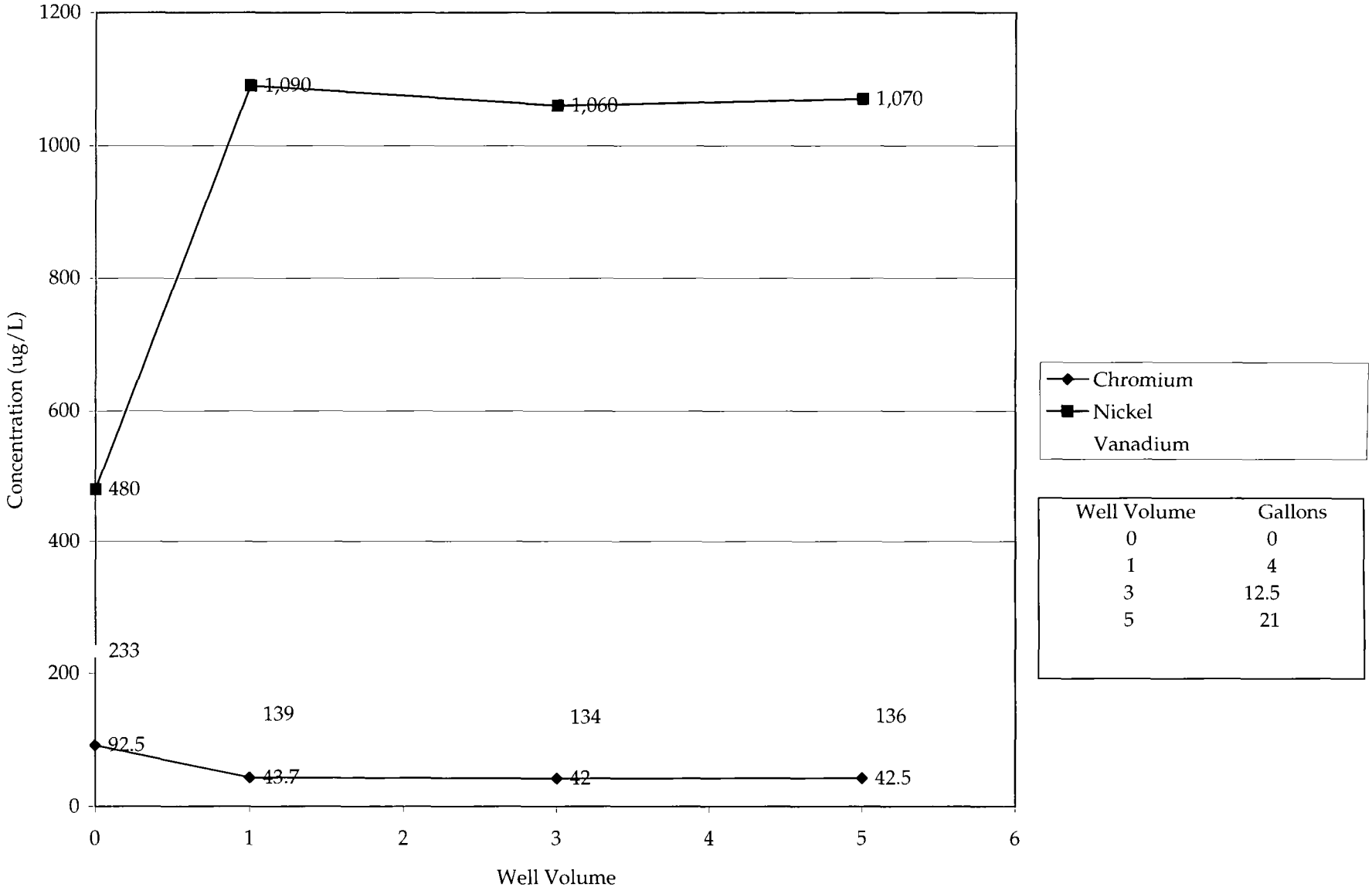
FIG: S:\CPF\AS8\AS810\01\ACAD\RPT2001\FIGA-2.DWG JULY 12, 2002 - 08:52:41
DRAWN: FK

FIGURE A-2

MONITORING WELL NETWORK
MIDCO II SITE
GARY, INDIANA

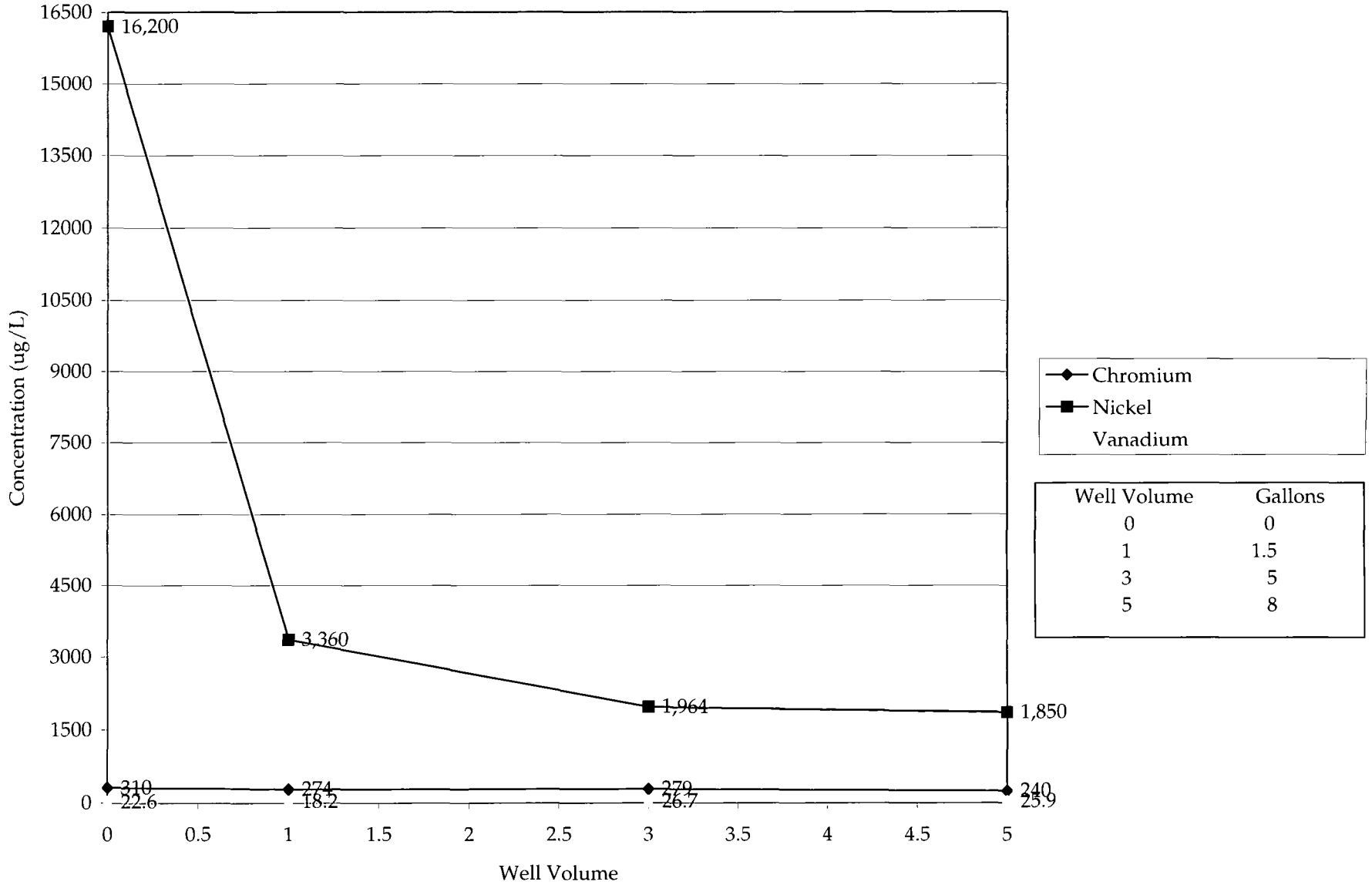
ERM

Figure A-3
Corrosion Evaluation
Total Metals
G-30 - Midco I



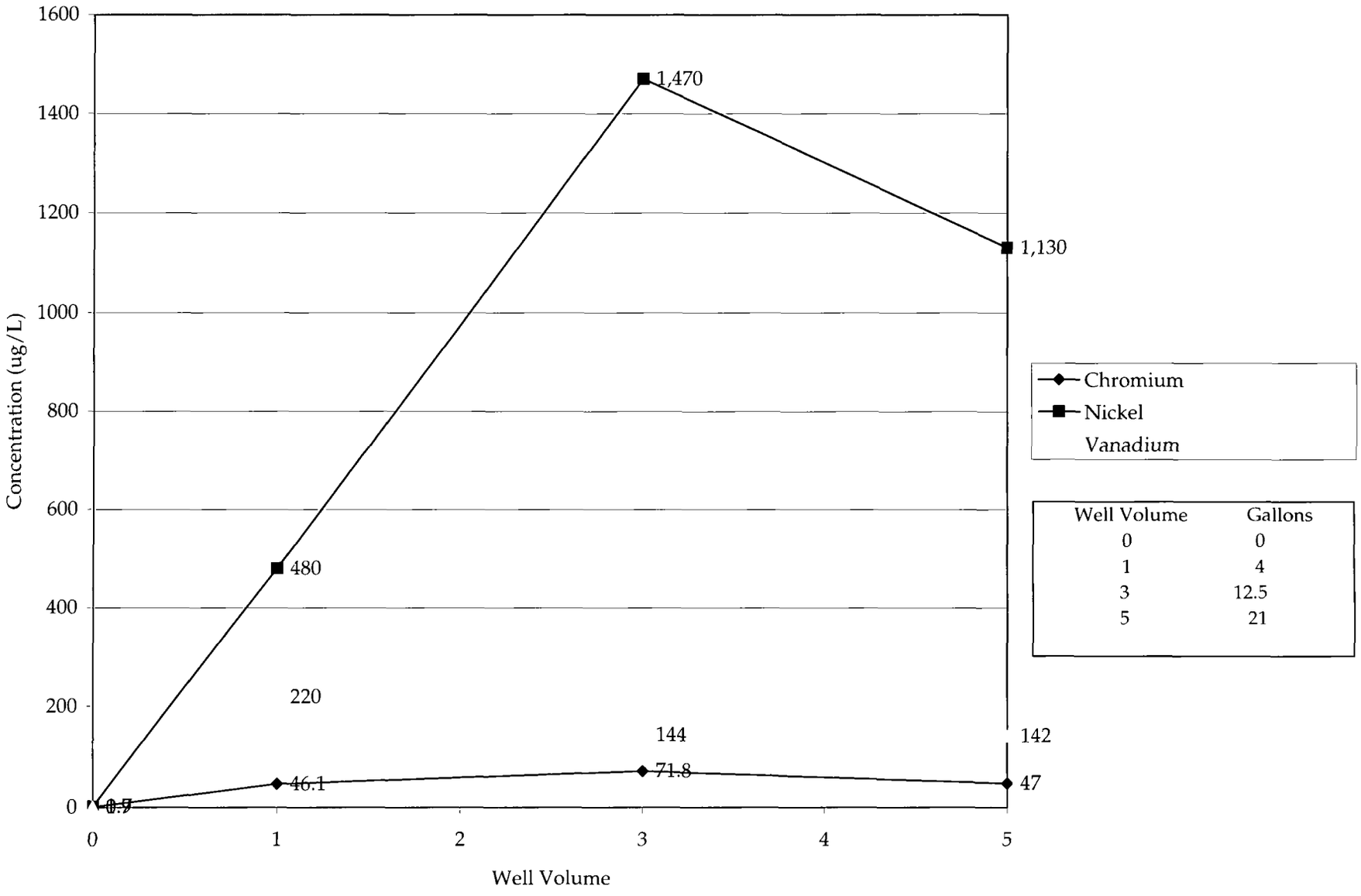
s:\cpf\as8\as810\01\sprdsht\A-3_A-6_corrosion_graphs 071202.xls\G-30 total graph

Figure A-4
Corrosion Evaluation
Total Metals
MW-6S



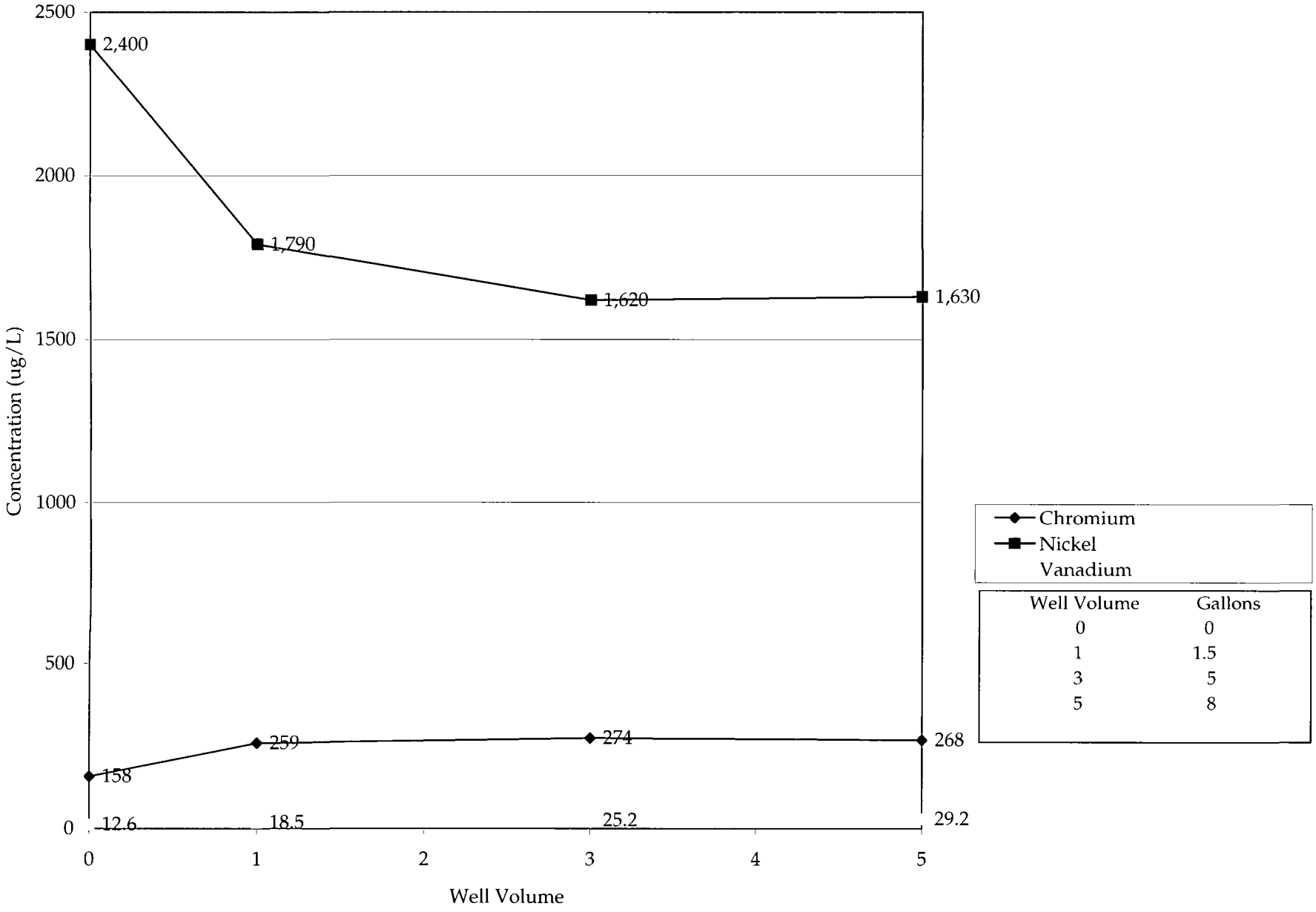
s:\cpf\as8\as810\01\sprdsht\A-3_A-6_corrosion_graphs 071202.xls\MW-6s total graph

Figure A-5
Corrosion Evaluation
Dissolved Metals
G-30 - Midco I



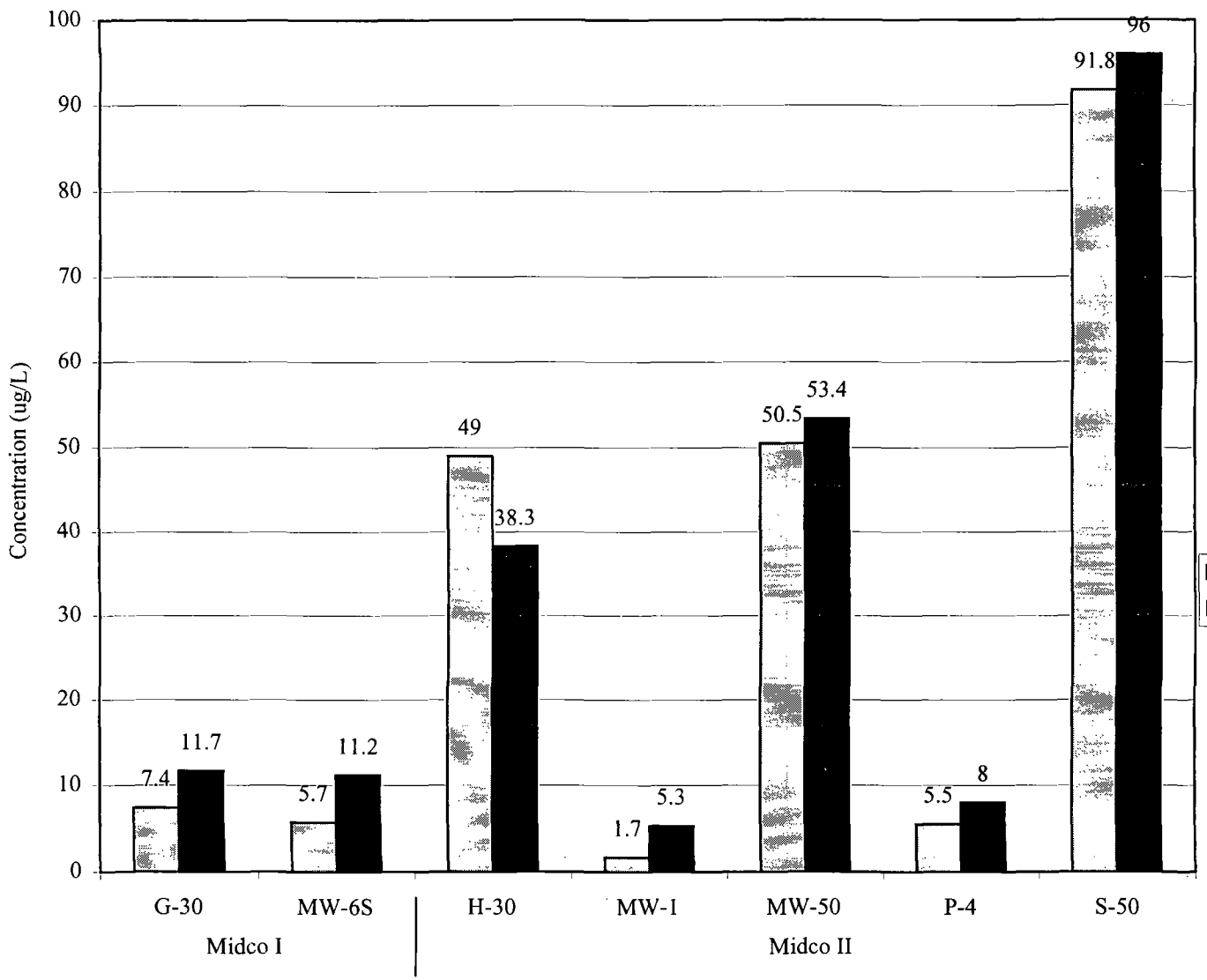
s:\cpf\as8\as810\01\sprdsht\A-3_A-6_corrosion_graphs 071202.xls\G-30 dissolved graph

Figure A-6
Corrosion Evaluation
Dissolved Metals
MW-6S - Midco I



s:\cpf\as8\as810\01\sprdsht\A-3_A-6_corrosion_graphs 071202.xls\MW-6Sdissolved graph

Figure A-7
Total vs Dissolved Arsenic (ICP)
Midco I and II
Gary, Indiana

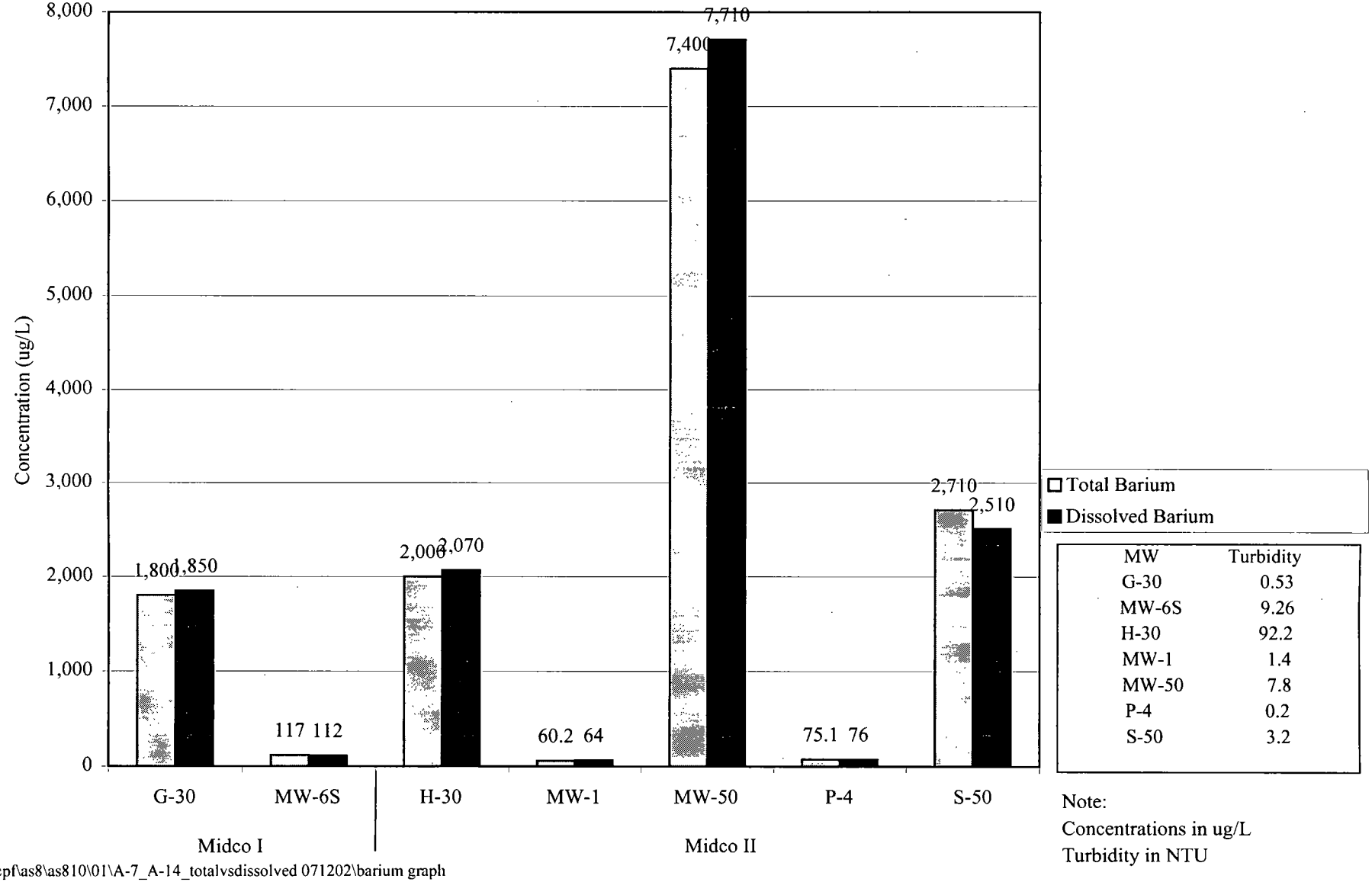


MW	Turbidity
G-30	0.53
MW-6S	9.26
H-30	92.2
MW-1	1.4
MW-50	7.8
P-4	0.2
S-50	3.2

Note:
Concentrations in ug/L
Turbidity in NTU

s:\cpf\as8\as810\01\A-7_A-14_totalvsdissolved 071202\arsenic graph

Figure A-8
Total vs. Dissolved Barium
Midco I and II
Gary, Indiana

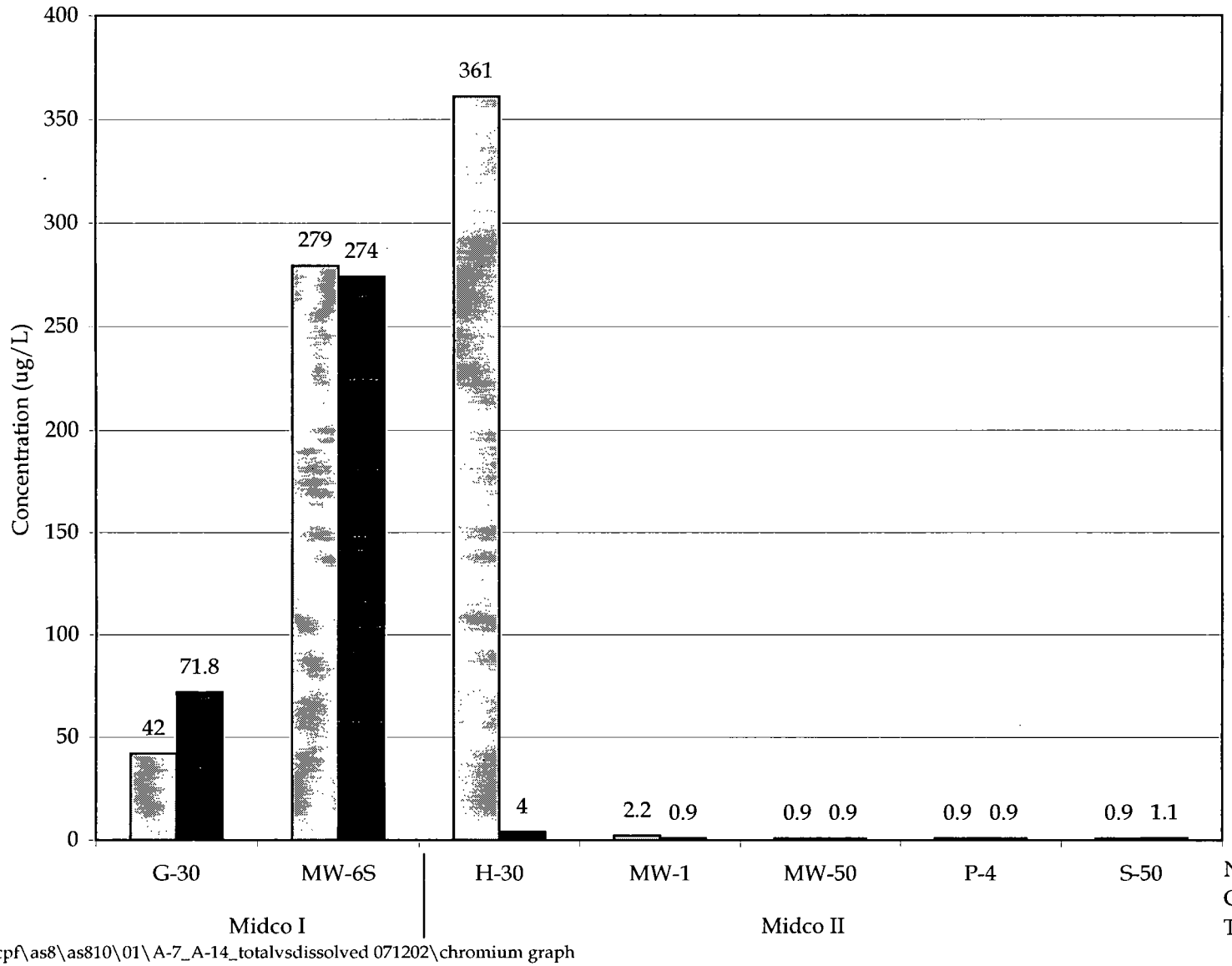


MW	Turbidity
G-30	0.53
MW-6S	9.26
H-30	92.2
MW-1	1.4
MW-50	7.8
P-4	0.2
S-50	3.2

Note:
Concentrations in ug/L
Turbidity in NTU

s:\cpf\as8\as810\01\A-7_A-14_totalvsdissolved 071202\barium graph

Figure A-9
Total vs. Dissolved Chromium
Midco I and II
Gary, Indiana

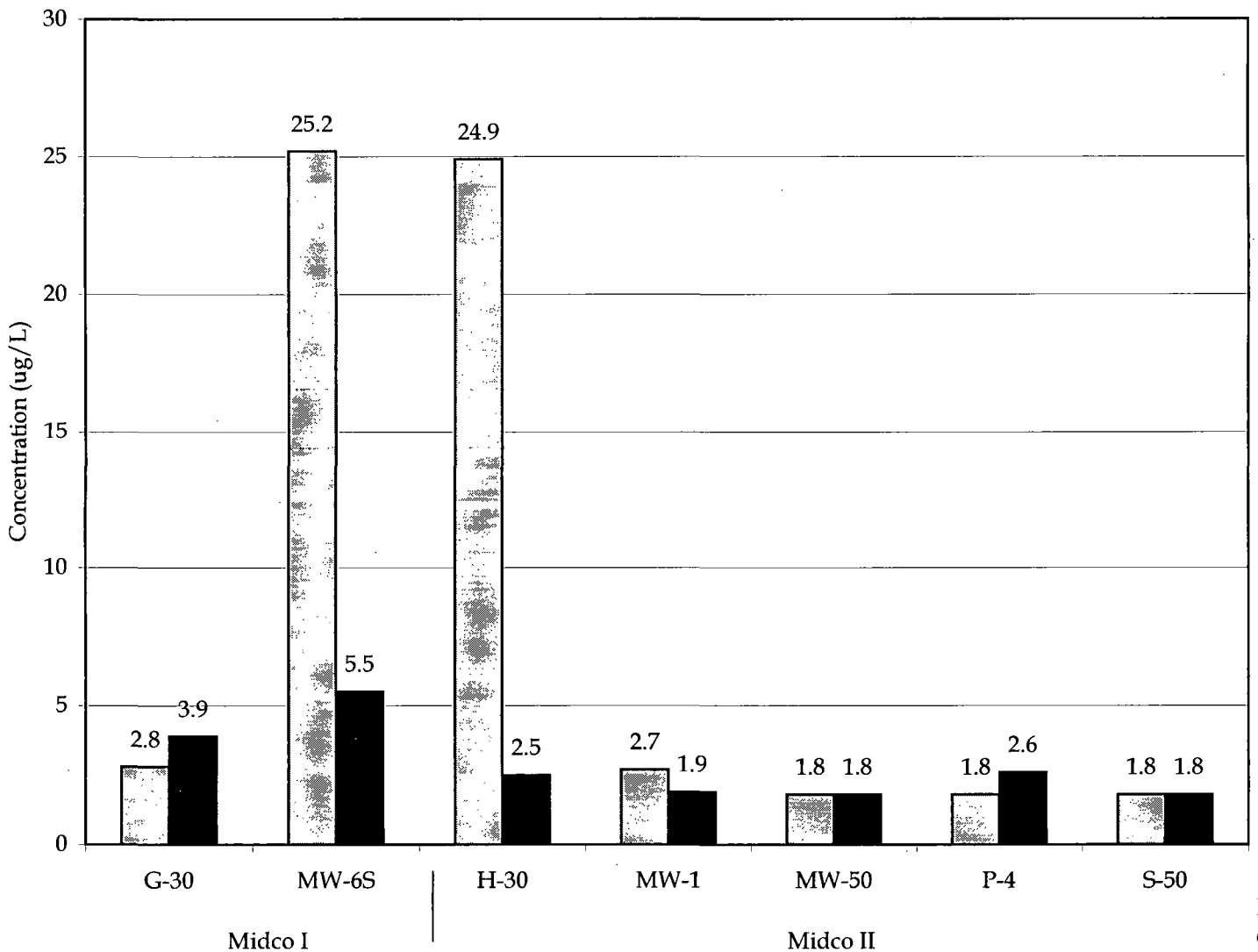


MW	Turbidity
G-30	0.53
MW-6S	9.26
H-30	92.2
MW-1	1.4
MW-50	7.8
P-4	0.2
S-50	3.2

Note:
Concentrations in ug/L
Turbidity in NTU

s:\cpf\as8\as810\01\A-7_A-14_totalvsdissolved 071202\chromium graph

Figure A-10
Total vs. Dissolved Copper
Midco I and II
Gary, Indiana

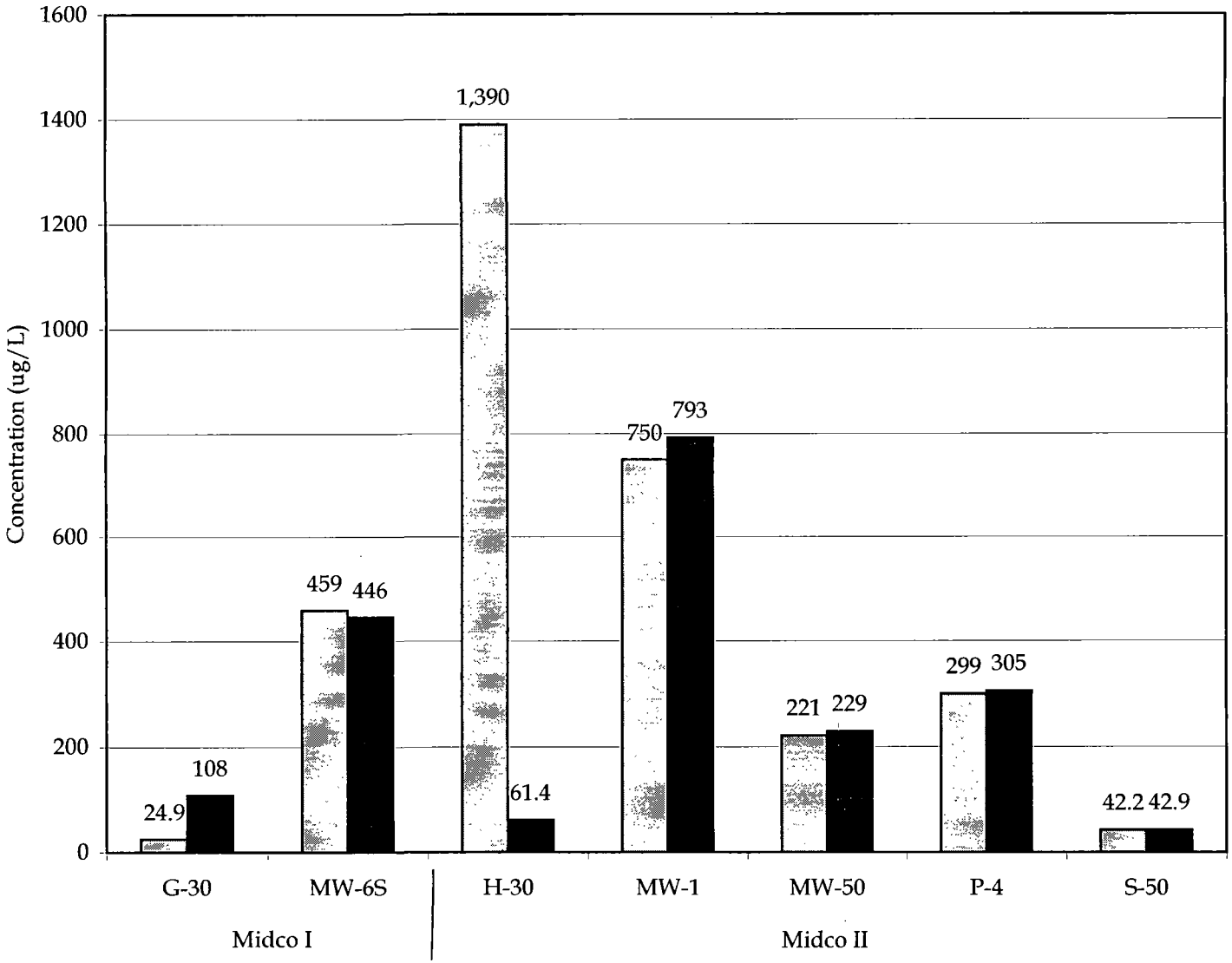


MW	Turbidity
G-30	0.53
MW-6S	9.26
H-30	92.2
MW-1	1.4
MW-50	7.8
P-4	0.2
S-50	3.2

Note:
Concentrations in ug/L
Turbidity in NTU

s:\cpf\as8\as810\01\A-7_A-14_totalvsdissolved 071202\copper graph

Figure A-11
Total vs. Dissolved Manganese
Midco I and II
Gary, Indiana

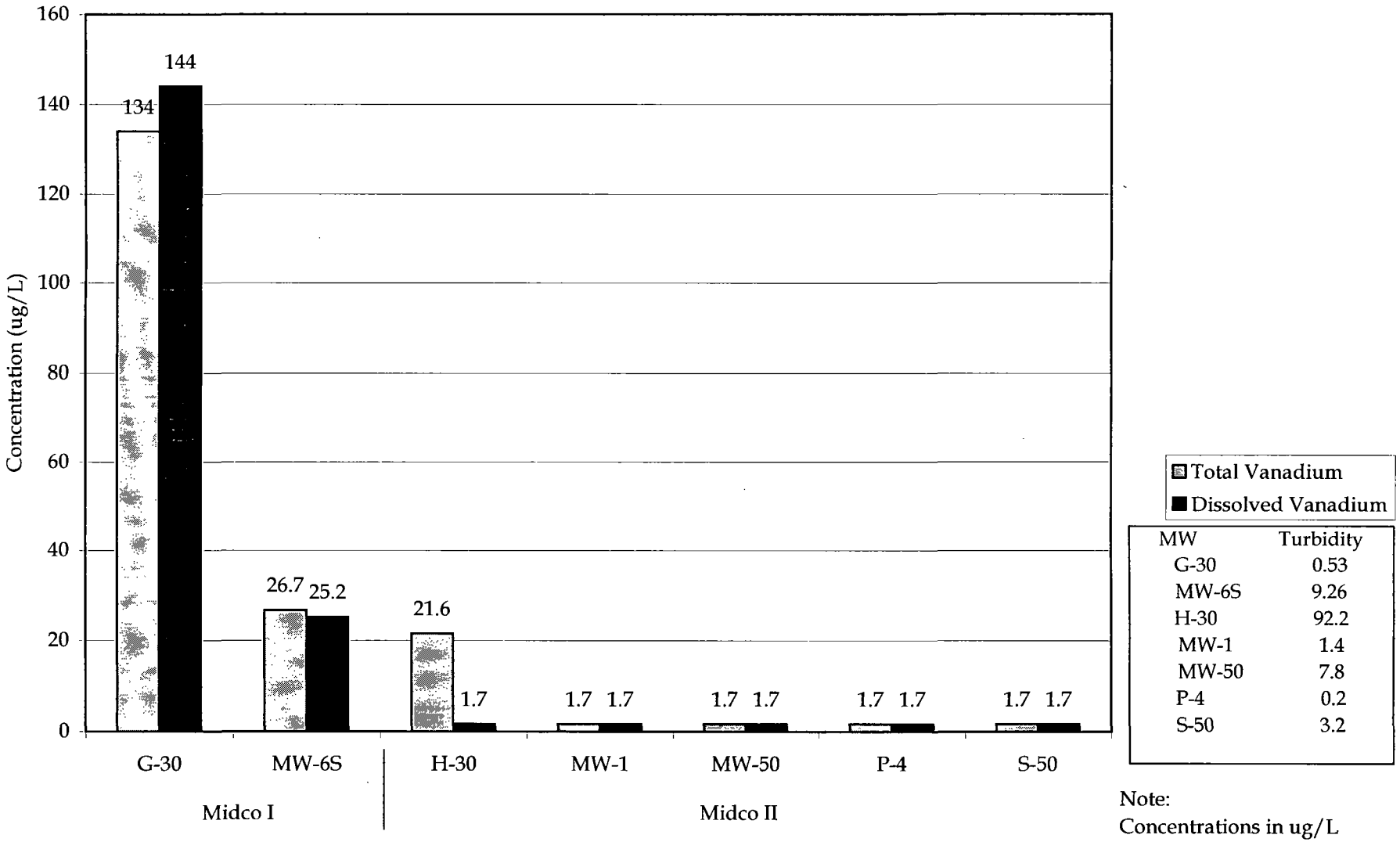


MW	Turbidity
G-30	0.53
MW-6S	9.26
H-30	92.2
MW-1	1.4
MW-50	7.8
P-4	0.2
S-50	3.2

Note:
Concentrations in ug/L
Turbidity in NTU

s:\cpf\as8\as810\01\A-7_A-14_totalvsdissolved 071202\manganese graph

Figure A-12
Total vs. Dissolved Vanadium
Midco I and II
Gary, Indiana

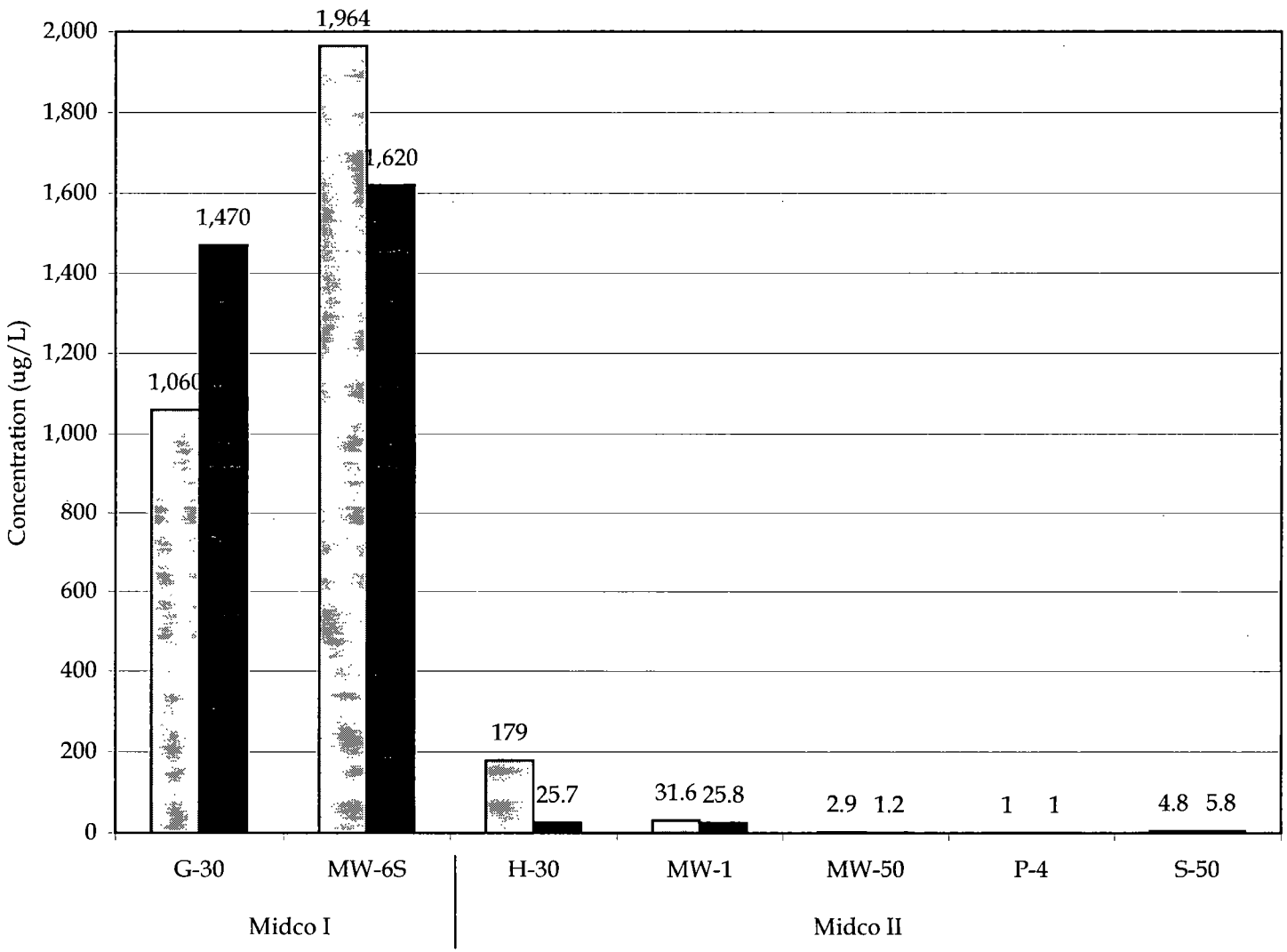


MW	Turbidity
G-30	0.53
MW-6S	9.26
H-30	92.2
MW-1	1.4
MW-50	7.8
P-4	0.2
S-50	3.2

Note:
Concentrations in ug/L
Turbidity in NTU

s:\cpf\as8\as810\01\A-7_A-14_totalvsdissolved 071202\vanadium graph

Figure A-13
Total vs. Dissolved Nickel
Midco I and II
Gary, Indiana



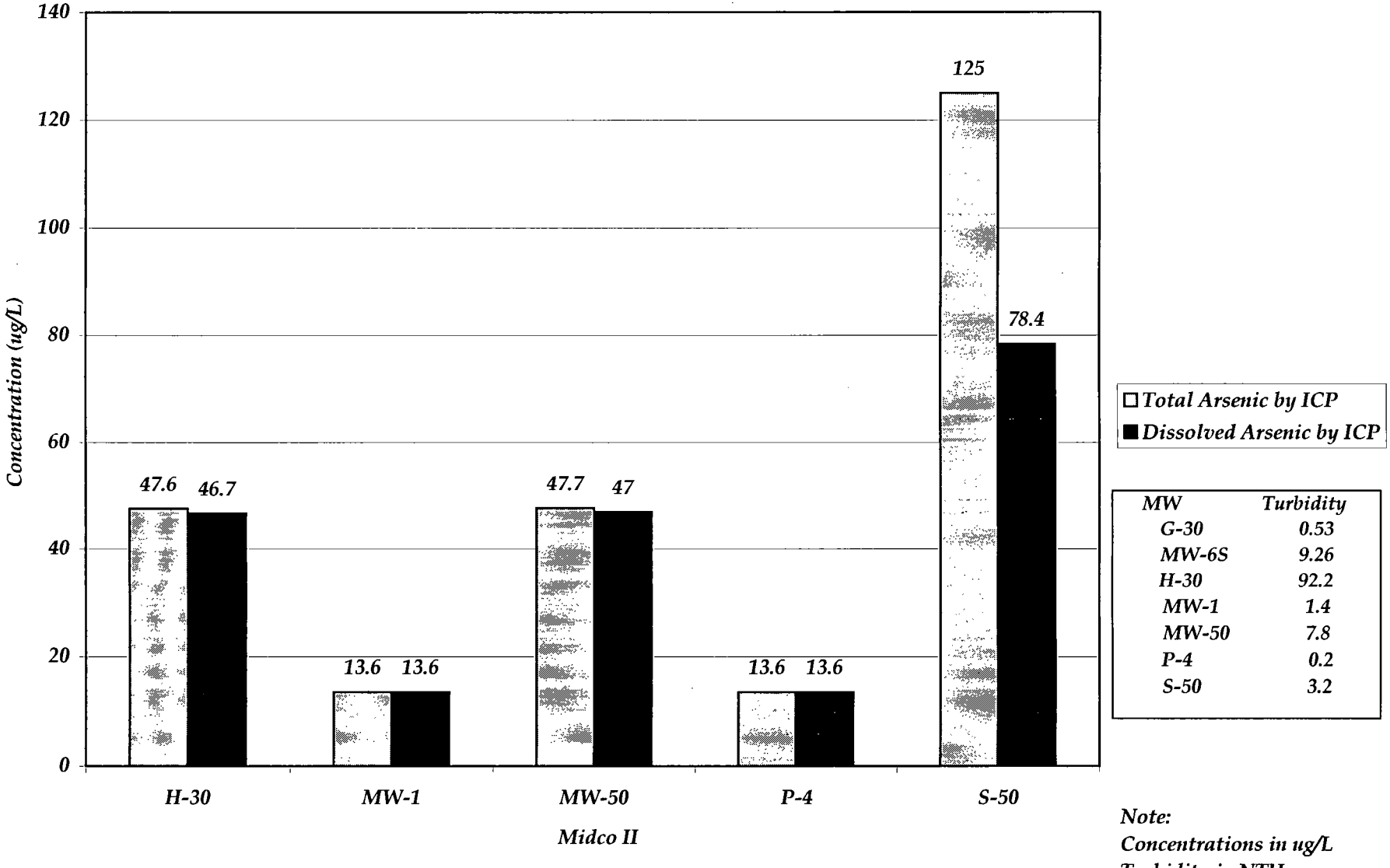
Total Nickel
Dissolved Nickel

MW	Turbidity
G-30	0.53
MW-6S	9.26
H-30	92.2
MW-1	1.4
MW-50	7.8
P-4	0.2
S-50	3.2

Note:
Concentrations in ug/L
Turbidity in NTU

s:\cpf\as8\as810\01\A-7_A-14_totalvsdissolved 071202\nickel graph

Figure A-14
Total vs. Dissolved Arsenic (ICP-MS)
Midco I and II
Gary, Indiana



MW	Turbidity
G-30	0.53
MW-6S	9.26
H-30	92.2
MW-1	1.4
MW-50	7.8
P-4	0.2
S-50	3.2

Note:
Concentrations in ug/L
Turbidity in NTU

s:\cpf\as8\as810\01\A-7_A-14_totalvsdissolved 071202\arsenic icp graph

Figure A-15
Comparison of ICP to ICP-MS
Total Arsenic
Midco II
Gary, Indiana

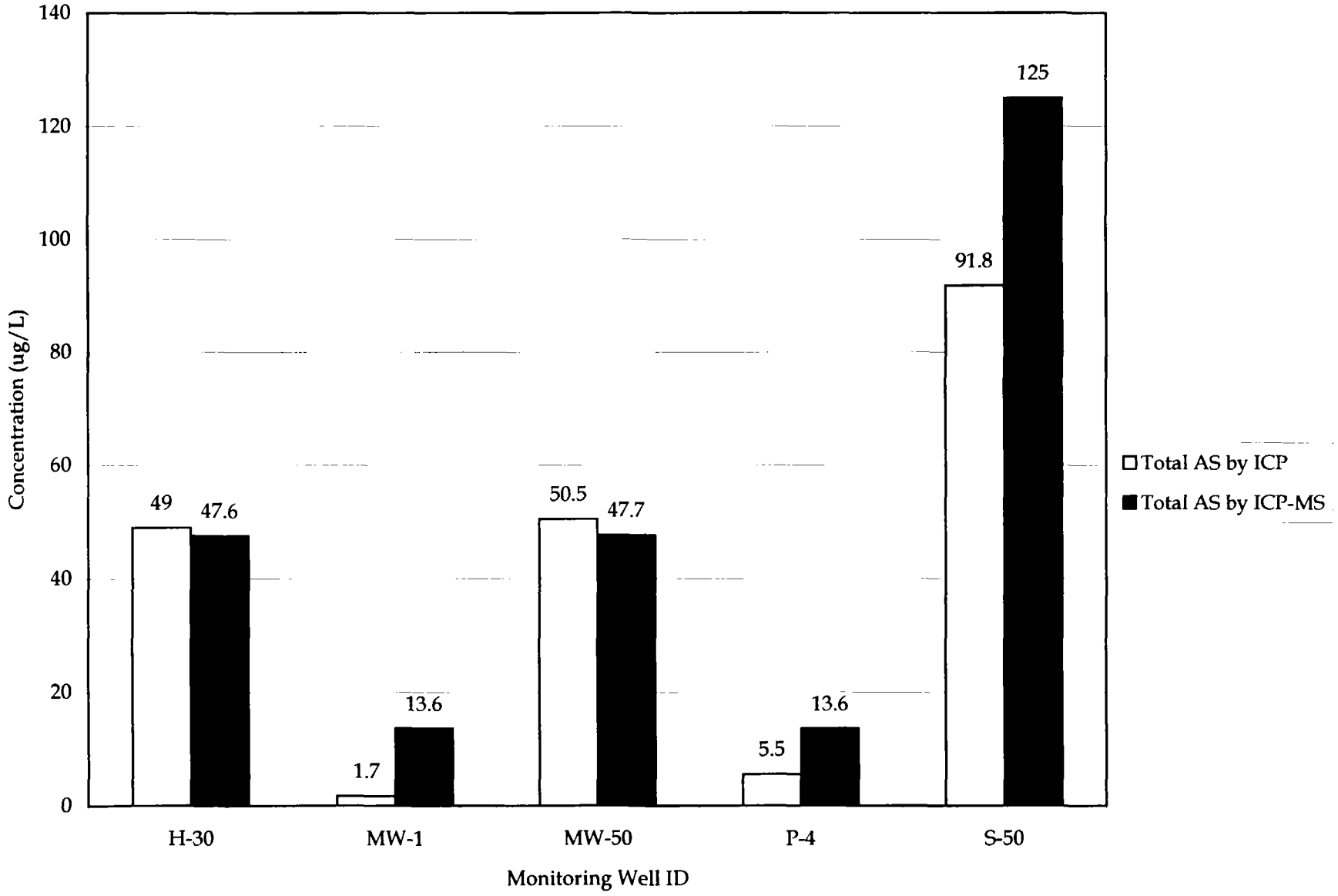
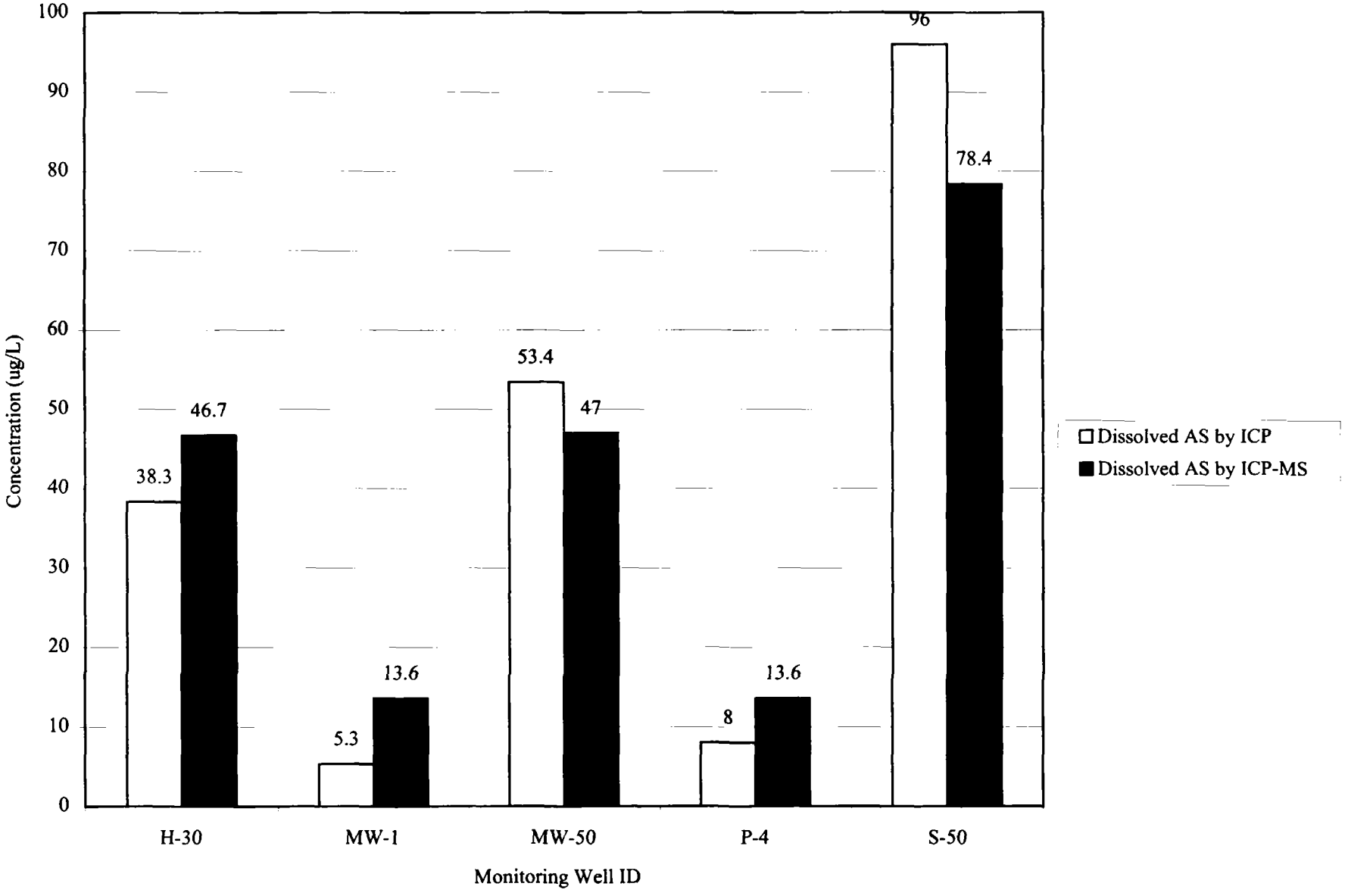


Figure A-16
Comparison of ICP to ICP-MS
Dissolved Arsenic
Midco II
Gary, Indiana



APPENDIX B

Evaluation of Organics Outside the Exclusion Zone at Midco I

APPENDIX B

EVALUATION OF ORGANICS
OUTSIDE THE EXCLUSION ZONE AT MIDCO I

The 2001 annual ground water monitoring at the Midco I site indicated that low concentrations of chlorinated and non-chlorinated organic compounds were detected outside the Exclusion Zone that posed carcinogenic risks above 1 x 10^{-5} and /or were above their respective MCLs or site specific AWQC. Specifically, the May 2001 ground water sampling event results indicated that chloroform and methylene chloride were detected at monitoring well B-30 above the site specific AWQC. Also, benzene and trichloroethene (TCE) were detected at monitoring well P-10 above the AWQC. The organics results from the 2001 ground water sampling are summarized in Table B-1.

In order to evaluate the off-site organics, an exploration program was performed to delineate the nature and extent of organics outside the Exclusion Zone at Midco I. A limited ground water sampling program, consisting of six temporary well points, was conducted on April 18, 2002 in the vicinity of monitoring wells P-10 and B-30. Figure B-1 shows the locations of the Midco I wells and temporary well points.

A. Geoprobe Sampling

The April 2002 ground water sampling was conducted by ENVIRON and Mid America Drilling Services using a Geoprobe SP15 sampler. This equipment consists of a four-foot sampling sleeve that is driven into the subsurface by the Geoprobe. The sleeve is retracted and a stainless steel well screen is exposed at the desired sampling depth. The water that infiltrates the screen is sampled using a peristaltic pump.

Ground water samples were obtained from a depth of approximately 10 feet below ground surface at each of the five sampling locations. At location 4N, an additional temporary well was installed at a depth of 30 feet and sampled. Ground water samples were obtained from each of the sampling points for Project Specific VOC analysis. Also, two ground water samples were analyzed for parameters used to determine the feasibility of *in-situ* bioremediation, if needed.

B. Investigation Results

The ground water analytical results for VOCs from the temporary wells are summarized in Table B-2. Low levels of benzene were found at two locations. One location encountered vinyl chloride at the CAL. However, three locations showed no compounds above the CALs. Ground water from two sampling locations was also analyzed for metabolic acids, nutrients, iron and manganese in April 2002. These bioremediation parameters (metabolic acids, nutrients, iron and manganese) are summarized in Table B-3.

The results of the May 2001 and April 2002 investigations were used to estimate the area of organics outside of the Midco I exclusion area, as shown in Figure B-2. This area includes temporary wells (10 feet deep) and Midco I wells (shallow) with benzene concentrations above the Clean up Action Level (CAL).

No exceedances of benzene or vinyl chloride above their CALs were found in the deeper Midco I wells outside the Exclusion Zone or in Temporary Well TW-4N-30, which was sampled at a depth of 30 feet. Therefore the organics outside the Exclusion Zone are limited to a relatively small area within the sandy soils centered approximately on TW-45 and above a depth of approximately 20 to 25 feet.

TABLE B-1

DECTECTED GROUND WATER ANALYTICAL PARAMETERS - VOLATILE ORGANIC COMPOUNDS
(From 2001 Annual Ground Water Report)
MIDCO I SITE
GARY, INDIANA

Well ID: / Collection Date: / Notes: / Units:	B-10 March 2001 µg/L	B-30 March 2001 µg/L	P-10 March 2001 µg/L	P-30 March 2001 µg/L	R-10 March 2001 µg/L	R-30 March 2001 µg/L	Clean Up Action Level [1] µg/L
Acetone							
Benzene			40				2.69
Bromochloromethane							
Bromodichloromethane							
Bromoform							
Bromomethane							
2-Butanone							588
Carbon disulfide	0.1 J	0.08 J	0.1 J	0.1 J	0.1 J		
Carbon tetrachloride							0.6
Chlorobenzene							48.7
Chloroethane	1 J	50	23	0.6 J			
Chloroform		0.8 J					1.2
Chloromethane							
Dibromochloromethane							
1,2-Dibromo-3-chloropropane							
1,2-Dibromoethane							0.05
1,2-Dichlorobenzene							600
1,3-Dichlorobenzene							
1,4-Dichlorobenzene							13.5
1,1-Dichloroethane	0.3 J		1				780
1,2-Dichloroethane							0.86
1,1-Dichloroethene							0.74
cis-1,2-Dichloroethene			1				
trans-1,2-Dichloroethene		0.3 J	0.3 J	0.2 J			
1,2-Dichloropropane							4.76
cis-1,3-Dichloropropene							
trans-1,3-Dichloropropene							
Ethylbenzene			3				700.00
2-Hexanone							
Methylene chloride		6 J					5.00
4-Methyl-2-pentanone			1 J				1618
Styrene							0.03
1,1,2,2-Tetrachloroethane							0.39
Tetrachloroethene							5
Toluene		0.1 J	110				1,000
1,2,4-Trichlorobenzene							
1,1,1-Trichloroethane							200
1,1,2-Trichloroethane							1.36
Trichloroethene			0.7 J				5
Vinyl chloride			0.5 J				2
Xylene (total)			11				3,861

Key:

J = The concentration is approximate since it was detected below the reportable quantitation limit

[1] Blank spaces indicate that no Clean-up Action Level has been established for that analyte

TABLE B-2

GROUND WATER ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
TEMPORARY WELL SAMPLES - APRIL 2002
MIDCO I SITE
GARY, INDIANA

Sample ID:	1-4N-10	1-4N-30	1-4S 0402	1-G4-S-0402	1-PE-0402	1-PN-4/18/02	
Sample Location:	Geoprobe 4N	Geoprobe 4N	Geoprobe 4S	Geoprobe G4S	Geoprobe PE	Geoprobe PN	Clean-up Action Level [1]
Sample Depth:	10 ft	30 ft	10 ft	10 ft	10 ft	10 ft	
Collection Date:	4/18/02	4/18/02	4/18/02	4/18/02	4/18/02	4/18/02	
Notes:							
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Acetone	9	0.1 J	14	15	7	5	
Benzene	3	0.4 JB	51 B	2	0.2 J	0.6 J	2.69
Bromochloromethane	1 U	1 U	3 U	1 U	1 U	1 U	
Bromodichloromethane	1 U	1 U	3 U	1 U	1 U	1 U	
Bromoform	1 U	1 U	3 U	1 U	1 U	1 U	
Bromomethane	1 U	1 U	3 U	1 U	1 U	1 U	
2-Butanone	5 U	5 U	16 U	5 U	5 U	5 U	588
Carbon disulfide	1 U	9	8	1	0.3 J	0.3 J	
Carbon tetrachloride	1 U	1 U	3 U	1 U	1 U	1 U	0.6
Chlorobenzene	1 U	1 U	3 U	1 U	1 U	1 U	48.7
Chloroethane	1 U	1 U	3 U	9	1 U	0.2 U	
Chloroform	1 U	1 U	3 U	0.2 J	1 U	1 U	1.2
Chloromethane	0.02 J	1 U	3 U	0.9 J	0.1 J	1 U	
Dibromochloromethane	1 U	1 U	3 U	1 U	1 U	1 U	
1,2-Dibromo-3-chloropropane	1 U	1 U	3 U	1 U	1 U	1 U	
1,2-Dibromoethane	1 U	1 U	3 U	1 U	1 U	1 U	0.05
1,2-Dichlorobenzene	1 U	1 U	3 U	1 U	1 U	1 U	600
1,3-Dichlorobenzene	1 U	1 U	3 U	1 U	1 U	1 U	
1,4-Dichlorobenzene	1 U	1 U	0.6 JB	1 U	1 U	1 U	13.5
1,1-Dichloroethane	1 U	1 U	3 U	1 U	1 U	1 U	780
1,2-Dichloroethane	1 U	1 U	3 J	1 U	1 U	1 U	0.86
1,1-Dichloroethene	1 U	0.3 J	3 U	1 U	1 U	1 U	0.74
cis-1,2-Dichloroethene	1 U	1 U	3 U	1 U	1 U	1 U	
trans-1,2-Dichloroethene	1 U	1 U	3 U	1 U	1 U	1 U	
1,2-Dichloropropane	1 U	1 U	3 U	1 U	1 U	1 U	4.76
cis-1,3-Dichloropropene	1 U	1 U	3 U	1 U	1 U	1 U	
trans-1,3-Dichloropropene	1 U	1 U	3 U	1 U	1 U	1 U	
Ethylbenzene	0.8 J	0.3 J	3 U	0.2 J	0.3 J	0.2 J	700.00
2-Hexanone	5 U	5 U	16 U	5 U	5 U	5 U	
Methylene chloride	2 U	1	6 U	2 U	2 U	1	5.00
4-Methyl-2-pentanone	5 U	5 U	16 U	5 U	5 U	5 U	1618
Styrene	1 U	1 U	3 U	1 U	1 U	1 U	0.03
1,1,2,2-Tetrachloroethane	1 U	1 U	3 U	1 U	1 U	1 U	0.39
Tetrachloroethene	1 U	1 U	3 U	1 U	1 U	1 U	5
Toluene	1	2	2 J	1	0.8 J	1	1,000
1,2,4-Trichlorobenzene	1 U	1 U	3 U	1 U	1 U	1 U	
1,1,1-Trichloroethane	1 U	1 U	3 U	1 U	1 U	1 U	200
1,1,2-Trichloroethane	1 U	1 U	3 U	1 U	1 U	1 U	1.36
Trichloroethene	1 U	1 U	3 U	1 U	1 U	1 U	5
Vinyl chloride	1 U	1 U	0.4 J	1 U	2	1 U	2
Xylene (total)	1	2	0.7 J	1	0.5 J	0.9 J	3,861

Key:

J = The concentration is approximate since it was detected below the reportable quantitation limit

U = Compound was analyzed for but was not detected at or above the associated detection limit

B = This compound was detected in the associated blank, at concentration 0 2 ug/l

[1] Blank spaces indicate that no Clean-up Action Level has been established for that analyte.

TABLE B-3

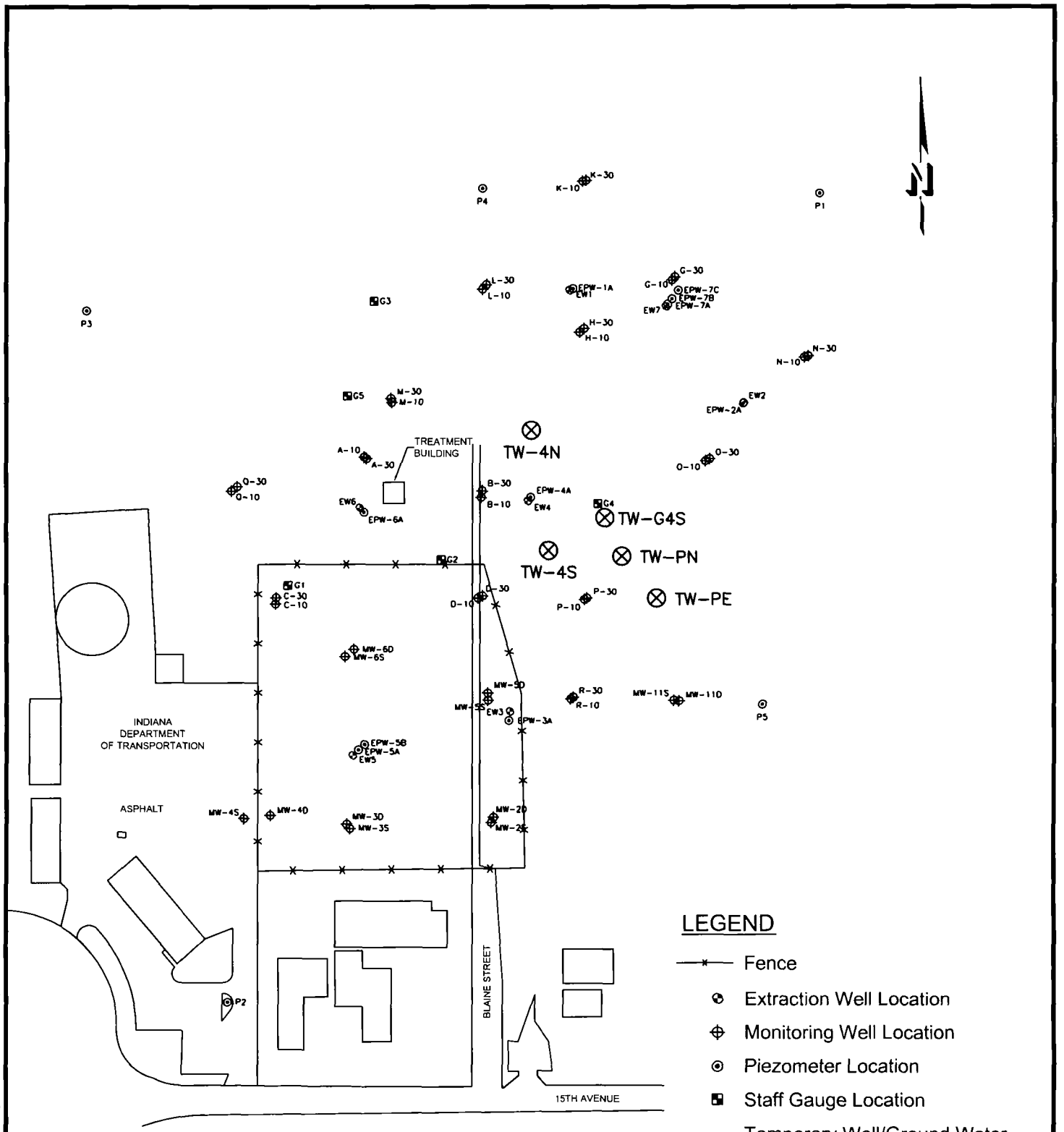
NATURAL ATTENUATION PARAMETER ANALYISIS RESULTS
APRIL 2002 GROUND WATER INVESTIGATION
MIDCO I - GARY, INDIANA

ANALYTICAL REPORT May 03, 2002
Project: Regensis
Project Number: Midco I Gary, IN Matrix: Water

Analyte	Result	MRL	Method	Analyst	Date / Time Analyzed	
ENVIRON Sample No. PE41802		*Collected: 04/18/02 10:00*				
Pyruvic Acid (C3)	<0.1 mg/l	0.10	HPLC/UV	FIZ	04/25/02	10:58
Lactic Acid (C3)	<1.0 mg/l	1.00	HPLCIUV	PIZ	04/25/02	10:58
Acetic Acid (C2)	<1.0 mg/l	1.00	HPLC/UV	FIZ	04/25/02	10:58
Propionic Acid (C3)	<1.0 mg/l	1.00	HPLC/EJV	FEZ	04/25/02	10:58
Butyric Acid (C4)	<1.0 mg/l	1.00	HPLC/UV	FEZ	04/25/02	*1O;58*
Nitrogen, Total Kjeldahl	10.70 mg/l	1.00	SM 4500-N ORG	KRV	04/24/02	16:46
Nitrogen1 Ammonia	3.17 mg/l	0.50	SM 4500-NH3 B,	KRV	04/24/02	16:53
Sulfide, total	<.5 mg/l	0.50	EPA 376.2	LKM	04/23102	14:17 R-01
Total Organic Carbon	6.20 mg/l	0.10	EPA 9060	MIS	05/02/02	0:00
Alkalinity, as CaCo3	292 mg/l	10.00	SM 2320B	MAQ	04/20/02	10:44
Chloride	228 mg/l	10.00	EPA 9056	HZ	04/19/02	14:15
Nitrogen, Nitrate+Nitrite	<0.2 mg/l	0.20	EPA 9056	FIZ	04/19/02	13:32
Sulfate	138 mg/l	10.00	EPA9056	FIZ	04/19/02	14:15
Iron, dissolved	1.79 mg/l	0.03	EPA 200.7	LAR.	04/22/02	16:00
Manganese, dissolved	0.208 mg/l	0.01	EPA 200.7	tAR	04/22/02	16:00
Iron, total	10.80 mg/l	0.03	EPA 200.7	LAR	04/22/02	*15:50*
Manganese1 total	0.477 mg/l	0.01	EPA 200.7	LAR	04/22/02	15:50
Phosphorus, total	<1.0 mg/l	1.00	EPA 200.7	LAR	04/22/02	15:50
ENVIRON Sample No. 4N30		*Collected 4/18/02 12:15*				
Pyruvic Acid (C3)	1.6 mg/l	0.10	I-IPLC/CV	FIZ	04/24/02	21:06
Lactic Acid (C2)	<1.0 mg/l	1.00	HPLC/UV	FIZ	04/24/02	2 1:06
Acetic Acid (C2)	470.0 mg/l	1.00	HPLCIUV	FIZ	04/24/02	21:06
Propionic Acid (C3)	<1.0 mg/l	1.00	HPLC/UV	FIZ	04/24/02	2 1:06
Butyric Acid (C4)	*<1.0 mg/l*	*1.00*	*HPLC/UV*	*FIZ*	*04/24/02*	21:06
Nitrogen, Total Kjeldahl	286.0 mg/l	10.00	SM 4500-N ORG	KRV	04/24/02	16:46
Nitrogen, Ammonia	302.0 mg/l	10.00	SM 4500-NH3 B,	KRV	04/24/02	16:53
Sulfide, total	<.5 mg/l	0.50	EPA 376.2	LKM	04/23/02	14:17 R-Ol
Total Organic Carbon	78.7 mg/l	1.00	EPA 9060	MJS	05/02/02	0:00
Alkalinity,	2440.0 mg/l	50.00	SM 2320B	MAQ	04/20/02	10:44
Chloride	4980.0 mg/l	100.00	EPA 9056	FIZ	04/19/02	14:29
Nitrogen, Nifrate+Nitrite	<0.2 mg/l	0.20	EPA9056	FIZ	4/19/02	16:39
Sulfate	7.2 mg/l	1.00	EPA 200.7	FIZ	4/19/02	13:47
Iron, dissolved	2.2 mg/l	0.03	EPA 200.7	LAR	4/22/02	16:00
Manganese, dissolved	0.054 mg/l	0.01	EPA 200.7	LAR	4/22/02	16:00
Iron, total	13.6 mg/l	0.03	EPA 200.7	LAR	4/22/02	15:50
Manganese, total	0.271 mg/l	0.01	EPA 200.7	LAR	4/22/02	15:50
Phosphorus, total	2.6 mg/l	1.00	EPA 200.7	I..AR	4/22/02	15:50

End of Report

Keystone Laboratories, Inc. Newton, 1A 50208
Ericka Werntz Fax 641-792-7989
Project Manager Phone 641-792-8451



LEGEND

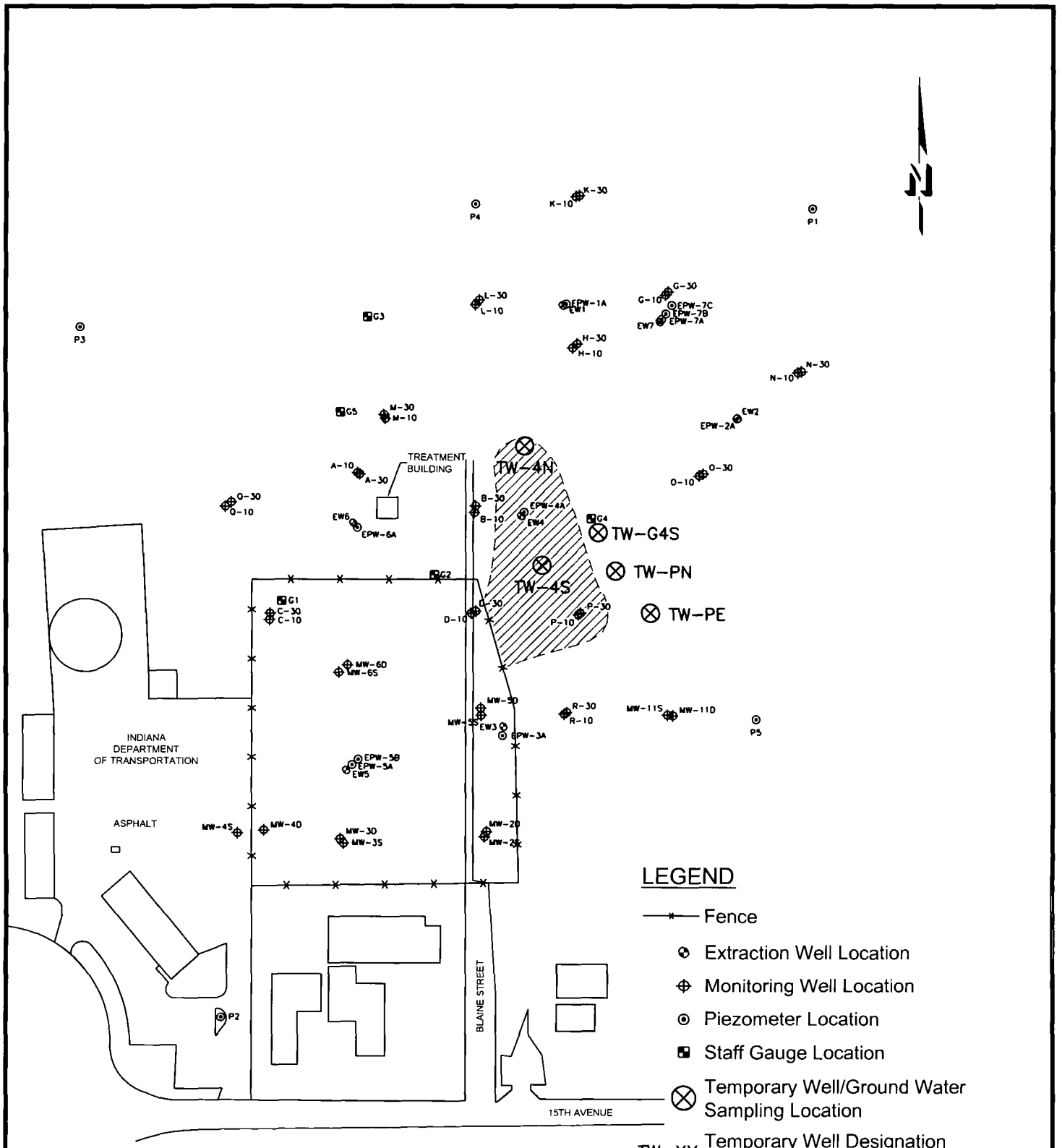
- Fence
- Extraction Well Location
- Monitoring Well Location
- Piezometer Location
- Staff Gauge Location
- Temporary Well/Ground Water Sampling Location
- TW–XX Temporary Well Designation

APPROX. SCALE (ft.)
0 200

CPFs/Midco Alternative Remedy/workplan appendices/Appendix B gw organics/April 2002 Temporary Well Locations

ENVIRON 740 Waukegan Road, Suite 401, Deerfield, IL 60015	April 2002 Temporary Well Locations Midco I Site Gary, Indiana	Figure B-1

Drafter: APR Date: 05/01/02 Contract Number: 21-8601W Approved: CB Revised:



LEGEND

- Fence
- Extraction Well Location
- Monitoring Well Location
- Piezometer Location
- Staff Gauge Location
- Temporary Well/Ground Water Sampling Location
- TW–XX Temporary Well Designation April 2002
- Estimated Area Above GW CALs (based on April 2002 Temporary Wells)

APPROX. SCALE (ft.)
0 200

CPFs/Midco Alternative Remedy/ Workplan Appendices/appendix B gw organics/Estimated Impact Area Outside Exclusion Zone

ENVIRON
740 Waukegan Road, Suite 401, Deerfield, IL 60015

Estimated Impact Area Outside Exclusion Zone
April 2002
Midco I Site
Gary, Indiana

Figure
B-2

Drafter: APR Date: 5/09/02 Contract Number: 21-8601W Approved: CB Revised:

APPENDIX C

Test Pits at Midco II to Determine the Presence of LNAPL

APPENDIX C

TEST PITS AT MIDCO II TO DETERMINE THE PRESENCE OF LNAPL

Despite previous investigations at Midco II, there was uncertainty as to the amount and extent, if any, of light non-aqueous phase liquids (LNAPL) in the general vicinity of the old filter bed. This area is considered the most heavily impacted area of Midco II and is a key to the design of remediation at the site. To more accurately determine the extent and amount, of LNAPL if any, nine test pits were excavated on March 20 and 21, 2002 in the general vicinity of the old filter bed area of the northern portion of the Midco II site. The test pits allowed observation of the shallow ground water for evidence of LNAPL. In addition, ground water and soil samples were obtained for analysis.

The test pit locations are shown in Figure C-1. Test pit logs with descriptions of the test pits and soils observed are attached. Selected photographs are also included in this appendix. The test pit locations were selected using information regarding the location of the former filter bed and "hot spots" identified by previous monitoring/investigations with input from the USEPA representative (Mr. Richard Boice), who was on-site during this investigation. As specified in the work plan approved by the USEPA for this task, Level C personnel protective equipment was utilized during excavation.

A. Test Pit Procedures and Sampling

At each of the nine test pit locations, the surface soils (the upper 1 to 2 feet) were initially excavated using a backhoe and stockpiled. The subsoils were then excavated, (stockpiled separately, on visqueen) until ground water infiltration was apparent. The ground water was then allowed to infiltrate until reaching an equilibrium level in the test pit. The ground water that infiltrated into each of the test pits was sampled using a glass sampler connected to a dipping pole. The ground water sample then transferred from the glass sampler directly into the appropriate laboratory containers. The ground water analysis results are summarized in Tables C-1, C-2 and C-3.

Soil samples were obtained from Test Pits AA-3, A-2, A-7, A-8, and C-5 from the depth of the water in the test pit. Specific depths are included on the attached test pit logs. In addition, a soil sample from approximately two feet above the water table was taken at test pits A-2 and A-7. Upon excavation from the sidewall of the test pit at the desired depth, the soil samples for analysis were taken from the backhoe bucket, using a stainless steel spoon or directly into the laboratory-supplied sampling jar. The analytical results are presented in Tables C-4, C-5, and C-6.

Additional liquid samples were obtained from test pits that exhibited sheen on the surface of the ground water. The surface of the test pit water was skimmed with the glass sampler and dipping pole. The sampler included a phase separator, to allow decanting of LNAPL layers, if encountered. No clear layers were noted in the sampler at any of the test pits, therefore the upper portion of the sampled liquid was transferred to the laboratory containers for analysis. These samples were initially designated "sheen" samples, however, they were actually primarily ground water. "Sheen" samples were obtained from Test Pits AA-3, A-2, and A-8. Tables C-7, C-8, and C-9 summarize the "sheen" sample analytical results.

The excavated test pit soils were returned to the pit after sampling was completed, taking care to return the surface soils as the upper layer. The samples were shipped under chain of custody control to a CPL laboratory, CompuChem of Cary, NC, for volatile organic compounds (VOC), semivolatile organic compounds (SVOCs), pesticides and Polychlorinated Biphenyls (PCBs) analyses.

B. Results Summary

The activities provided an opportunity to observe the existing condition of the ground water at nine potentially impacted areas of the Midco II site. No LNAPL layers were observed on the ground water in these locations, although a sheen was present at some locations. The "sheen" samples, although high in ethyl benzene, toluene and xylene, are not considered indicative of a layer of LNAPL.

The soil results generally showed no exceedances of the project STALs for VOCs, SVOCs, or PCBs. The only exeception was an anomalous single PCB (anoclor-1260) detected at Test Pit A-7 at 1400 µg/kg on a diluted sample. No PCBs were found in the

ground water sample at this location, therefore, we believe no special action is called for during remedial activities.

The ground water results showed levels of VOCs similar to the adjacent monitoring wells. Test Pit C-5 ground water had no exceedances of the project Clean-up Action Levels (CALs).

C. Impact on Remedial Activities

As no LNAPL was encountered in this investigation, no special remedial design is needed to handle LNAPL at the Midco II site.

TABLE C-1

GROUND WATER ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
TEST PIT INVESTIGATION - MARCH 2002
MIDCO II SITE
GARY, INDIANA

Sample ID:	2TPA2W	2TPA7W	2TPA8W [1]	2TPB3W [1]	2TPC5W	2TPC8W [1]	2TPD8W	
Test Pit No. :	A-2	A-7	A-8	B-3	C-5	C-8	D-8	Clean-up
Collection Date:	3/21/2002	3/21/2002	3/20/2002	3/20/2002	3/21/2002	3/20/2002	2/13/2002	Action
Notes:							Reanalysis	Level [2]
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Acetone	16,000 U	6,300 U	5,000 U	5,000 U	10 U	5,000 U	250 U	3,240
Benzene	3,100 U	1,300 U	230 J	1,000 U	2 U	1,000 U	160	2.7
Bromochloromethane	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	
Bromodichloromethane	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	
Bromoform	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	
Bromomethane	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	
2-Butanone	16,000 U	6,300 U	5,000 U	5,000 U	10 U	5,000 U	250 U	588
Carbon disulfide	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	
Carbon tetrachloride	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	0.6
Chlorobenzene	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	48.7
Chloroethane	3,100 U	1,300 U	1,000 U	1,000 U	0.5 J	1,000 U	50 U	
Chloroform	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	1.2
Chloromethane	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	
Dibromochloromethane	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	
1,2-Dibromo-3-chloropropane	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	0.50
1,2-Dibromoethane	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	48.8
1,2-Dichlorobenzene	3,100 U	130 JB	470 JBD	1,000 U	2 U	1,000 U	50 U	600
1,3-Dichlorobenzene	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	
1,4-Dichlorobenzene	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	13.5
1,1-Dichloroethane	3,100 U	1,300 U	800 J	270 J	2 U	310 J	50 U	780.0
1,2-Dichloroethane	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	0.86
1,1-Dichloroethene	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	0.074
cis-1,2-Dichloroethene	1,400 J	1,500	6,600	4,000	2 U	820 J	50 U	70
trans-1,2-Dichloroethene	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	100
1,2-Dichloropropane	3,100 U	1,300 U	810 J	1,000 U	2 U	380 J	50 U	4.76
cis-1,3-Dichloropropene	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	
trans-1,3-Dichloropropene	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	
Ethylbenzene	17,000	7,500	24,000 D	14,000	2 U	13,000	430	700
2-Hexanone	16,000 U	6,300 U	5,000 U	5,000 U	10 U	5,000 U	250 U	
Methylene chloride	6,300 U	2,500 U	2,000 U	2,000 U	4 U	2,000 U	100 U	5.0
4-Methyl-2-pentanone	16,000 U	6,300 U	5,900	760 J	10 U	840 J	250 U	1,618
Styrene	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	10
1,1,2,2-Tetrachloroethane	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	0.39
Tetrachloroethene	3,100 U	1,300 U	170 J	1,000 U	2 U	1,000 U	50 U	5.0
Toluene	51,000	20,000	100,000 D	28,000 D	0.4 J	30,000 D	120	1,000
1,2,4-Trichlorobenzene	410 JB	190 J	1,200 JBD	390 JBD	0.4 JB	460 JBD	50 U	29.4
1,1,1-Trichloroethane	3,100 U	1,300 U	1,000 U	790 J	2 U	1,000 U	50 U	200
1,1,2-Trichloroethane	3,100 U	1,300 U	1,000 U	1,000 U	2 U	1,000 U	50 U	1.36
Trichloroethene	3,100 U	310 J	1,000 U	1,000 U	2 U	320 JD	50 U	5.0
Vinyl chloride	3,100 U	1,300 U	200 J	1,000 U	2 U	1,000 U	50 U	2.0
Xylene (total)	51,000	19,000	76,000 D	39,000	2 U	38,000 D	2,700	3,861
Total VOCs	120,810	48,630	216,380	87,210	1.3	84,130	3,410	

Key:

J = The concentration is approximate since it was detected below the reportable quantitation limit
U = Compound was analyzed for but was not detected at or above the associated detection limit
D = This concentration is the result of analysis at a higher dilution factor
B = This compound was detected in the associated blank
VOCs = Volatile organic compounds

[1] The laboratory reported the results of the original sample and a dilution. The results shown are either the highest positive results or the lowest detection limit. Higher estimated positive results were disregarded if accurate positive results were detected.

[2] Blank spaces indicate that no Clean-up Action Level has been established for that analyte.

TABLE C-2

GROUND WATER ANALYTICAL RESULTS - SEMIVOLATILE ORGANIC COMPOUNDS
TEST PIT INVESTIGATION
MIDCO II SITE
GARY, INDIANA

Sample ID:	2TPA2W	2TPA7W [1]	2TP8W [1]	2TPB3W [1]	2TPC5W	2TPC8W	
Test Pit No.:	A-2	A-7	A-8	B-3	C-5	C-8	Clean-up Action Level [2]
Collection Date:	3/21/2002	3/21/2002	3/20/2002	3/20/2002	3/21/2002	3/20/2002	
Notes:							
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Acenaphthene	24 J	9 JD	40 U	4 J	5 U	100 U	
Acenaphthylene	40 U	10 U	40 U	20 U	5 U	100 U	
Acetophenone	40 U	10 U	40 U	20 U	5 U	100 U	
2-Acetylaminofluorene	80 U	20 U	80 U	40 U	10 U	200 U	
Anthracene	43	16	40 U	4 J	5 U	100 U	
Aramite	160 U	40 U	160 U	80 U	20 U	400 U	
Benzo(a)anthracene	66	11	40 U	9 J	5 U	100 U	2.814
Benzo(a)pyrene	46	10 JD	40 U	6 J	5 U	100 U	0.028
Benzo(b)fluoranthene	70	11	40 U	180 D	5 U	100 U	0.094
Benzo(g,h,i)perylene	26 J	4 J	40 U	4 J	5 U	100 U	
Benzo(k)fluoranthene	29 J	7 JD	40 U	6 J	5 U	100 U	
Benzoic acid	1,200 E	410 JD	2,900 D	2,600 JD	5 J	1,800 J	129,450
Benzyl alcohol	40 U	10 U	40 U	20 U	5 U	100 U	
Bis(2-chloroethoxy)methane	40 U	10 U	40 U	20 U	5 U	100 U	
Bis(2-chloroethyl)ether	40 U	10 U	40 U	20 U	5 U	100 U	
Bis(2-ethylhexyl)phthalate	380 B	190 BD	140 B	320 BD	6 B	58 JB	23.1
4-Bromophenyl phenyl ether	40 U	10 U	40 U	20 U	5 U	100 U	
Butyl benzyl phthalate	16 J	10 JD	40 U	19 J	5 U	100 U	6,473
4-Chloroaniline	40 U	10 U	40 U	20 U	5 U	100 U	9.25
Chlorobenzilate	40 U	10 U	40 U	20 U	5 U	100 U	
4-Chloro-3-methylphenol	40 U	10 U	40 U	20 U	5 U	100 U	
2-Chloronaphthalene	40 U	10 U	40 U	20 U	5 U	100 U	
2-Chlorophenol	40 U	10 U	40 U	20 U	5 U	100 U	
4-Chlorophenyl phenyl ether	40 U	10 U	40 U	20 U	5 U	100 U	
Chrysene	55	12	40 U	9 J	5 U	100 U	2.814
Di-n-butyl phthalate	110	34	6 J	66	5 U	18 J	3,236
Di-n-octyl phthalate	220	150	5 J	160	5 U	33 J	
Dibenzo(a,h)anthracene	7 J	1 J	40 U	3 J	5 U	100 U	0.0281
Dibenzofuran	22 J	6 JD	40 U	3 J	5 U	100 U	
3,3'-Dichlorobenzidine	40 U	10 U	40 U	20 U	5 U	100 U	
2,4-Dichlorophenol	40 U	10 U	40 U	20 U	5 U	34 J	97
Diethyl phthalate	40 U	10 U	5 J	20 U	5 U	100 U	25,890
Dimethyl phthalate	40 U	10 U	40 U	20 U	5 U	100 U	
2,4-Dimethylphenol	140	59 D	72	110	5 U	66 J	
1,3-Dinitrobenzene	80 U	20 U	80 U	40 U	10 U	200 U	
4,6-Dinitro-2-methylphenol	160 U	40 U	160 U	80 U	20 U	400 U	
2,4-Dinitrophenol	160 U	40 U	160 U	80 U	20 U	400 U	
2,4-Dinitrotoluene	40 U	10 U	40 U	20 U	5 U	100 U	
2,6-Dinitrotoluene	40 U	10 U	40 U	20 U	5 U	100 U	
Diphenylamine	17 J	20 U	40 J	20 JD	10 U	200 U	
Fluoranthene	190	29	40 U	20	5 U	100 U	
Fluorene	30 J	10	40 U	4 J	5 U	100 U	
Hexachlorobenzene	40 U	10 U	40 U	20 U	5 U	100 U	1
Hexachlorobutadiene	40 U	10 U	40 U	20 U	5 U	100 U	
Hexachlorocyclopentadiene	40 U	10 U	40 U	20 U	5 U	100 U	50
Hexachloroethane	40 U	10 U	40 U	20 U	5 U	100 U	
Indeno(1,2,3-cd)pyrene	25 J	6 JD	40 U	4 J	5 U	100 U	2.81
Isodrin	80 U	20 U	80 U	40 U	10 U	200 U	
Isophorone	40 U	10 U	40 U	20 U	5 U	100 U	78.9
2-Methylnaphthalene	79	75 D	19 JD	64	5 U	27 J	

TABLE C-2

GROUND WATER ANALYTICAL RESULTS - SEMIVOLATILE ORGANIC COMPOUNDS
TEST PIT INVESTIGATION
MIDCO II SITE
GARY, INDIANA

Sample ID:	2TPA2W	2TPA7W [1]	2TP8W [1]	2TPB3W [1]	2TPC5W	2TPC8W	Clean-up
Test Pit No.:	A-2	A-7	A-8	B-3	C-5	C-8	Action
Collection Date:	3/21/2002	3/21/2002	3/20/2002	3/20/2002	3/21/2002	3/20/2002	Level [2]
Notes:							
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
2-Methylphenol [3]	130	47	200 D	280 D	5 U	67 J	1,618
3- & 4-Methylphenol [3]	300	120	880	320	20 U	230 J	1,618
Naphthalene	500	270 D	170 D	660 D	5 U	270	12,940
2-Nitroaniline	160 U	40 U	160 U	80 U	20 U	400 U	
3-Nitroaniline	160 U	40 U	160 U	80 U	20 U	400 U	
4-Nitroaniline	160 U	40 U	160 U	80 U	20 U	400 U	
Nitrobenzene	40 U	10 U	40 U	20 U	5 U	100 U	16.2
2-Nitrophenol	40 U	10 U	40 U	20 U	5 U	100 U	
4-Nitrophenol	160 U	40 U	160 U	80 U	20 U	400 U	
N-Nitroso-di-n-propylamine	40 U	10 U	40 U	20 U	5 U	100 U	
N-Nitrosodiphenylamine	17 J	10 U	40	20 JD	5 U	100 U	66
N-Nitrosomorpholine	40 U	10 U	40 U	20 U	5 U	100 U	
N-Nitrosopyrrolidine	160 U	40 U	160 U	80 U	20 U	400 U	
2,2'-Oxybis(1-chloropropane)	40 U	10 U	40 U	20 U	5 U	100 U	
Pentachlorophenol	160 U	36 U	160 U	72 U	18 U	360 U	1
Phenanthrene	190	42	40 U	20	5 U	100 U	
Phenol	92	10 U	200 D	110	5 U	130	19,417
Pronamide	40 U	10 U	40 U	20 U	5 U	100 U	
Pyrene	140	26	40 U	20 JD	5 U	100 U	
2,3,4,6-Tetrachlorophenol	80 U	20 U	80 U	40 U	10 U	200 U	
2,4,5-Trichlorophenol	160 U	40 U	160 U	80 U	20 U	400 U	
2,4,6-Trichlorophenol	40 U	10 U	40 U	20 U	5 U	100 U	
Total SVOCs	4,164	1,565	4,677	5,045	11	2,733	

Key:

J = The concentration is approximate since it was detected below the reportable quantitation limit
U = Compound was analyzed for but was not detected at or above the associated detection limit
D = This concentration is the result of analysis at a higher dilution factor
B = This compound was detected in the associated blank
E = This concentration should be considered an estimate since exceeded the instrument calibration range
SVOCs = Semivolatile organic compounds

[1] The laboratory reported the results of the original sample and a dilution. The results shown are either the highest positive results or the lowest detection limit.

[2] Blank spaces indicate that no Clean-up Action Level has been established for that analyte.

[3] The Clean-up Action Level shown is for total methylphenol.

TABLE C-3

GROUND WATER ANALYTICAL RESULTS - CHLORINATED PESTICIDES/POLYCHLORINATED BIPHENYLS
TEST PIT INVESTIGATION - MARCH 2002
MIDCO II SITE
GARY, INDIANA

Sample ID:	2TPA2W [1]	2TPA7W	2TPA8W [1]	2TPB3W [1]	2TPC5W [1]	2TPC8W	
Test Pit No.:	A-2	A-7	A-8	B-3	C-5	C-8	Clean-up
Collection Date:	3/21/2002	3/21/2002	3/20/2002	3/20/2002	3/21/2002	3/20/2002	Action
Notes:							Level [2]
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Pesticides							
Aldrin	0.010 U	0.010 P	0.010 U	0.010 U	0.010 U	0.010 U	0.019
alpha-BHC	0.074 P	0.010 U	0.010 U	0.010 U	0.73 JPD	0.010 U	
beta-BHC	35 PD	0.010 U	0.010 U	0.066 P	0.025 P	0.010 U	
delta-BHC	0.010 U	0.010 U	0.29 P	0.021	0.010 U	0.058 P	
gamma-BHC (Lindane)	0.024 P	0.010 U	0.010 U	0.0015 JP	0.010 U	0.010 U	0.2
alpha Chlordane [3]	0.0075 JP	0.024 P	0.028 P	0.010 U	0.0036 JP	0.025 P	0.2489
gamma Chlordane [3]	0.010 U	0.026 P	0.0040 JP	0.011 P	0.010 U	0.017 P	0.2489
4,4'-DDD	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.018 JP	
4,4'-DDE	0.088 P	0.11 P	0.0041 JP	0.037 P	1.1 JPD	0.73 JPD	
4,4'-DDT	0.020 U	0.020 U	0.014 JP	0.012 JP	0.020 U	0.0036 JP	0.952
Dieldrin	0.020 U	0.044 P	0.095 P	0.020 U	0.020 U	0.031 P	0.0074
Endosulfan I	1.2 JPD	0.013 P	0.071	0.010 P	0.010 U	0.010 U	
Endosulfan II	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	
Endosulfan sulfate	0.020 U	0.016 JP	0.0092 JP	0.020 U	0.020 U	0.020 U	
Endrin	0.020 U	0.020 U	0.020 U	0.024 P	0.020 U	0.69 JPD	0.009
Endrin aldehyde	0.23 P	0.10 P	0.020 U	40 PD	0.020 U	0.038 P	
Endrin ketone	0.0060 JP	0.0063 JP	0.026 P	0.020 U	0.0015 JP	0.0081 J	
Heptachlor	0.024 P	0.010 U	0.010 U	0.028	0.010 U	0.010 U	0.4
Heptachlor epoxide	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.0137
Methoxychlor	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.012 JP	40
Toxaphene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	
Polychlorinated Biphenyls [4]							
Aroclor-1016	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.042
Aroclor-1221	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.042
Aroclor-1232	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.042
Aroclor-1242	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.042
Aroclor-1248	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.042
Aroclor-1254	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.042
Aroclor-1260	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.042

Key:

J = The concentration is approximate since it was detected below the reportable quantitation limit
U = Compound was analyzed for but was not detected at or above the associated detection limit
D = This concentration is the result of analysis at a higher dilution factor
P = A difference of 25% or greater was found between the two columns. The lower of these concentrations is reported

[1] The laboratory reported the results of the original sample and a dilution. The results shown are either the highest positive results or the lowest detection limit.

[2] Blank spaces indicate that no Clean-up Action Level has been established for that analyte.

[3] The Clean-up Action Level shown is for total chlordane.

[4] The Clean-up Action Level shown is for total polychlorinated biphenyls.

TABLE C-4

SOIL ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
TEST PIT INVESTIGATION - MARCH 2002
MIDCO II SITE
GARY, INDIANA

Sample ID:	2TPA2S5 [1]	2TPA2S7	2TPA7S6	2TPA7S6	2TPA7S8	2TPA8S [1]	2TPAA3S6 [1]	2TPC5S7	
Test Pit No.:	A-2	A-2	A-7	A-7	A-7	A-8	AA-3	C-5	Soil
Sample Depth:	5 ft	7.5 ft	6 ft	6 ft	8 ft	9.75 ft	6.5 ft	7.5 ft	Treatment
Collection Date:	3/21/2002	3/21/2002	3/21/2002	3/21/2002	3/21/2002	3/20/2002	3/21/2002	3/21/2002	Action
Notes:				Reanalysis					Level [2]
Units:	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
Acetone	6,300 U	1,600 U	140	550 J	1,800 J	59,000 U	6,900 U	12 U	17,000,000
Benzene	6,300 U	1,600 U	16	210 J	7,100 U	3,100 J	6,900 U	12 U	2,890,000
Bromodichloromethane	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	
Bromoform	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	
Bromomethane	2,100 JB	1,400 JB	14 U	2,100 B	1,100 JB	25,000 JB	4,800 JB	12 U	
2-Butanone	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	8,510,000
Carbon disulfide	6,300 U	1,600 U	10 J	1,800 U	7,100 U	59,000 U	6,900 U	12 U	
Carbon tetrachloride	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	363,000
Chlorobenzene	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	2,390,000
Chloroethane	3,500 J	480 J	14 U	670 JB	1,300 J	36,000 J	1,900 JB	12 U	
Chloroform	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	1,810,000
Chloromethane	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	
Dibromochloromethane	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	
1,2-Dibromo-3-chloropropane	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	9,700 JB	12 U	
1,2-Dibromoethane	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	
1,2-Dichlorobenzene	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	1,200 J	12 U	
1,3-Dichlorobenzene	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	
1,4-Dichlorobenzene	6,300 U	1,600 U	1 JB	1,800 U	7,100 U	59,000 U	6,900 U	12 U	
Dichlorodifluoromethane	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	
1,1-Dichloroethane	6,300 U	1,600 U	1 J	78 J	7,100 U	59,000 U	6,900 U	12 U	14,500,000
1,2-Dichloroethane	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	920,000
1,1-Dichloroethene	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	133,000
cis-1,2-Dichloroethene	6,300 U	1,600 U	14 U	59 J	570 J	6,300 J	400 J	12 U	
trans-1,2-Dichloroethene	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	
1,2-Dichloropropane	6,300 U	1,600 U	14 U	160 J	7,100 U	9,400 J	240 J	12 U	1,150,000
cis-1,3-Dichloropropene	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	
trans-1,3-Dichloropropene	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	
Ethylbenzene	540,000	5,800	2,100 E	7,600	64,000	2,200,000	300,000	0.8 J	16,100,000
2-Hexanone	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	
Methylene chloride	1,700 J	82 J	14 U	140 JB	340 J	19,000 J	770 J	2 JB	109,000,000
4-Methyl-2-pentanone	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	8,510,000
Styrene	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	
1,1,2,2-Tetrachloroethane	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	4,600 JB	12 U	392,000
Tetrachloroethene	2,000 J	1,600 U	14 U	210 J	7,100 U	15,000 J	2,400 J	12 U	1,540,000
Toluene	270,000	670 J	420 EB	2,900	46,000	3,800,000	180,000	3 JB	54,300,000
1,2,4-Trichlorobenzene	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	
1,1,1-Trichloroethane	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	5,780,000
1,1,2-Trichloroethane	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	576,000
Trichloroethene	410 JB	1,600 U	1 J	63 JB	7,100 U	59,000 U	1,000 JB	12 U	1,330,000
Vinyl chloride	6,300 U	1,600 U	14 U	1,800 U	7,100 U	59,000 U	6,900 U	12 U	
Xylene (total)	1,500,000	21,000	3,500 E	14,000	160,000	5,600,000	920,000	2 J	141,000,000
Total VOCs	**2,319,710**	**29,432**	**6,188**	**28,580**	**275,110**	**11,713,800**	**1,427,010**	**8**	

Key:

J = The concentration is approximate since it was detected below the reportable quantitation limit

U = Compound was analyzed for but was not detected at or above the associated detection limit

D = This concentration is the result of analysis at a higher dilution factor

B = This compound was detected in the associated blank

[1] The laboratory reported the results of the original sample and a dilution. The results shown are either the highest positive results or the lowest detection limit.

[2] Blank spaces indicate that no Soil Treatment Action Level (STAL) has been established for that analyte.

TABLE C-5

SOIL ANALYTICAL RESULTS - SEMIVOLATILE ORGANIC COMPOUNDS
TEST PIT INVESTIGATION - MARCH 2002
MIDCO II SITE
GARY, INDIANA

Sample ID:	2TPA2S5 [1]	2TPA2S7	2TPA7S6	2TPA7S8	2TPA8S	2TPAA3S6	2TPC5S7	
Test Pit No.:	A-2	A-2	A-7	A-7	A-8	AA-3	C-5	Soil
Sample Depth (ft):	5 ft	7.5 ft	6 ft	8 ft	9.75 ft	6.5 ft	7.5 ft	Treatment
Collection Date:	3/21/2002	3/21/2002	3/21/2002	3/20/2002	3/20/2002	3/21/2002	3/21/2002	Action
Notes:								Level [2]
Units:	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
Acenaphthene	550	160 J	1,400 U	450 U	11,000 U	450 J	410 U	
Acenaphthylene	58 J	410 U	1,400 U	450 U	11,000 U	140 J	10 J	
Acetophenone	400 U	94 JB	1,400 U	450 U	11,000 U	1,800 U	22 JB	
Anthracene	1,100	370 J	4,000	1,400	2,800 J	1,600 J	14 J	
Atrazine	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
Benzaldehyde	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
Benzo(a)anthracene	2,400	440	990 J	370 J	570 J	4,000	37 J	829,000
Benzo(a)pyrene	1,600	300 J	530 J	390 J	400 J	2,500	47 J	8,290
Benzo(b)fluoranthene	1,500	310 J	270 J	310 J	11,000 U	2,300	38 J	12,100
Benzo(g,h,i)perylene	760	110 J	370 J	310 J	11,000 U	1,200 J	91 J	
Benzo(k)fluoranthene	1,300	240 J	200 J	250 J	11,000 U	2,700	45 J	
1,1'-Biphenyl	230 JD	26 J	1,400 U	180 J	660 J	120 J	410 U	
Bis(2-chloroethoxy)methane	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
Bis(2-chloroethyl)ether	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	1,850,000
Bis(2-ethylhexyl)phthalate	8,600 BD	660 B	370 JB	810 B	5,000 JB	8,500 B	110 JB	1,850,000
4-Bromophenyl phenyl ether	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
Butyl benzyl phthalate	970	59 J	1,400 U	120 J	420 J	440 J	410 U	18,500,000
Caprolactam	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
Carbazole	590	270 J	810 J	390 J	1,100 J	470 J	410 U	
4-Chloroaniline	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
4-Chloro-3-methylphenol	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
2-Chloronaphthalene	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
2-Chlorophenol	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
4-Chlorophenyl phenyl ether	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
Chrysene	2,100	360 J	1,500	750	1,100 J	3,900	54 J	829,000
Dibenzo(a,h)anthracene	270 J	28 J	1,400 U	91 J	11,000 U	470 J	410 U	8,290
Dibenzofuran	470	140 J	760 J	320 J	740 J	410 J	410 U	
3,3'-Dichlorobenzidine	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
2,4-Dichlorophenol	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	797,000
Diethyl phthalate	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	74,100,000
2,4-Dimethylphenol	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
Dimethyl phthalate	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
4,6-Dinitro-2-methylphenol	1,000 U	1,000 U	3,500 U	1,100 U	28,000 U	4,400 U	1,000 U	
2,4-Dinitrophenol	1,000 U	1,000 U	3,500 U	1,100 U	28,000 U	4,400 U	1,000 U	797,000
2,4-Dinitrotoluene	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
2,6-Dinitrotoluene	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
Di-n-butyl phthalate	6,000 D	370 J	1,400 U	350 J	2,400 J	730 J	410 U	26,000,000
Di-n-octyl phthalate	9,900 D	630	1,400 U	1,100	2,700 J	4,200	410 U	
Fluoranthene	6,900 D	1,300	1,100 J	660	1,100 J	8,500	52 J	
Fluorene	690	250 J	2,100	1,100	1,500 J	720 J	410 U	
Hexachlorobenzene	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
Hexachlorobutadiene	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
Hexachlorocyclopentadiene	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
Hexachloroethane	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
Indeno(1,2,3-cd)pyrene	1,100	180 J	200 J	230 J	11,000 U	1,600 J	50 J	829,000
Isophorone	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
2-Methylnaphthalene	3,500 JD	110 J	7,200	2,500	27,000	2,000	16 J	
2-Methylphenol	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
4-Methylphenol	400 U	17 J	1,400 U	450 U	1,900 J	1,800 U	410 U	
Naphthalene	10,000 D	250 J	1,600	1,900	35,000	5,500	20 J	110,000,000
2-Nitroaniline	1,000 U	1,000 U	3,500 U	1,100 U	28,000 U	4,400 U	1,000 U	

TABLE C-5

SOIL ANALYTICAL RESULTS - SEMIVOLATILE ORGANIC COMPOUNDS
TEST PIT INVESTIGATION - MARCH 2002
MIDCO II SITE
GARY, INDIANA

Sample ID:	2TPA2S5 [1]	2TPA2S7	2TPA7S6	2TPA7S8	2TPA8S	2TPAA3S6	2TPC5S7	
Test Pit No.:	A-2	A-2	A-7	A-7	A-8	AA-3	C-5	Soil
Sample Depth (ft):	5 ft	7.5 ft	6 ft	8 ft	9.75 ft	6.5 ft	7.5 ft	Treatment
Collection Date:	3/21/2002	3/21/2002	3/21/2002	3/20/2002	3/20/2002	3/21/2002	3/21/2002	Action
Notes:								Level [2]
Units:	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
3-Nitroaniline	1,000 U	1,000 U	3,500 U	1,100 U	28,000 U	4,400 U	1,000 U	
4-Nitroaniline	1,000 U	1,000 U	3,500 U	1,100 U	28,000 U	4,400 U	1,000 U	
Nitrobenzene	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	132,000
2-Nitrophenol	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
4-Nitrophenol	1,000 U	1,000 U	3,500 U	1,100 U	28,000 U	4,400 U	1,000 U	
N-Nitroso-di-n-propylamine	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
N-Nitrosodiphenylamine	520	40 J	1,400 U	450 U	4,900 J	1,800 U	410 U	
2,2'-Oxybis(1-chloropropane)	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
Pentachlorophenol	1,000 U	1,000 U	3,500 U	1,100 U	28,000 U	4,400 U	1,000 U	7,970,000
Phenanthrene	6,200 D	1,300	6,800	2,000	4,700 J	7,400	58 J	
Phenol	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	159,000,000
Pyrene	5,000 D	940	3,300	1,600	1,700 J	7,300	79 J	
2,4,5-Trichlorophenol	1,000 U	1,000 U	3,500 U	1,100 U	28,000 U	4,400 U	1,000 U	
2,4,6-Trichlorophenol	400 U	410 U	1,400 U	450 U	11,000 U	1,800 U	410 U	
Total SVOCs	72,308	7,654	32,100	17,131	95,690	67,150	743	

Key:

J = The concentration is approximate since it was detected below the reportable quantitation limit
U = Compound was analyzed for but was not detected at or above the associated detection limit
D = This concentration is the result of analysis at a higher dilution factor
B = This compound was detected in the associated blank
SVOCs = Semivolatile organic compounds

[1] The laboratory reported the results of the original sample and a dilution. The results shown are either the highest positive results or the lowest detection limit. Higher estimated positive results were disregarded if accurate positive results were detected.

[2] Blank spaces indicate that no Soil Treatment Action Level has been established for that analyte.

TABLE C-6

SOIL ANALYTICAL RESULTS - CHLORINATED PESTICIDES/POLYCHLORINATED BIPHENYLS
TEST PIT INVESTIGATION - MARCH 2002
MIDCO II SITE
GARY, INDIANA

Sample ID:	2TPA2S5 [1]	2TPA2S7	2TPA7S6 [1]	2TPA7S8 [1]	2TPA8S [1]	2TPAA3S6 [1]	2TPC5S7	
Test Pit No.:	A-2	A-2	A-7	A-7	A-8	AA-3	C-5	Soil
Sample Depth:	5 ft	7.5 ft	6 ft	8 ft	9.75 ft	6.5 ft	7.5 ft	Treatment
Collection Date:	3/21/2002	3/21/2002	3/21/2002	3/21/2002	3/20/2002	3/21/2002	3/21/2002	Action
Notes:								Level [2]
Units:	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
Pesticides								
Aldrin	2.0 U	2.1 U	2.4 U	2.3 U	1.9 U	2.3 U	1.7 U	5,610
alpha-BHC	2.0 U	2.1 U	3.7 P	5.3 JPD	1.9 U	2.3 U	1.7 U	
beta-BHC	15 PD	2.1 U	2.4 U	37 PD	1.9 U	3.3 P	1.7 U	
delta-BHC	2.0 U	2.1 U	2.4 U	2.3 U	1.9 U	2.3 U	1.7 U	
gamma-BHC (Lindane)	2.0 U	2.1 U	2.4 U	2.3 U	1.9 U	2.3 U	1.7 U	
alpha Chlordane [3]	2.0 U	2.1 U	2.4 U	2.3 U	1.9 U	2.3 U	1.7 U	10,200
gamma Chlordane [3]	2.0 U	2.1 U	3.1 P	5.6 P	1.9 U	2.3 U	1.7 U	10,200
4,4'-DDD	11	4.1 U	4.6 U	4.5 U	3.8 U	4.4 U	3.3 U	
4,4'-DDE	16 JD	4.1 U	22 P	35 D	3.0 JP	11	3.3 U	
4,4'-DDT	7.6 P	4.1 U	4.6 U	89 E	5.0	4.4 U	3.3 U	102,000
Dieldrin	4.0 U	4.1 U	16 P	19	3.8 U	6.1 P	3.3 U	5,960
Endosulfan I	0.79 JP	2.1 U	2.4 U	2.3 U	1.9 U	2.3 U	1.7 U	
Endosulfan II	4.0 U	4.1 U	4.6 U	12 P	3.8 U	4.4 U	3.3 U	
Endosulfan sulfate	5.2 P	4.1 U	4.6 U	14 P	3.8 U	3.7 JP	3.3 U	
Endrin	4.0 U	4.1 U	4.6 U	52	3.8 U	4.4 U	3.3 U	61,300
Endrin aldehyde	43 PD	4.1 U	4.6 U	11 P	3.6 JP	23 PD	3.3 U	
Endrin ketone	4.0 U	4.1 U	4.6 U	4.5 U	3.8 U	4.4 U	3.3 U	
Heptachlor	2.0 U	2.1 U	54 PD	26 D	96 JPD	2.3 U	1.7 U	
Heptachlor epoxide	2.0 U	2.1 U	2.4 U	2.3 U	1.9 U	2.3 U	1.7 U	
Methoxychlor	20 U	21 U	24 U	23 U	19 U	23 U	17 U	
Toxaphene	200 U	210 U	240 U	230 U	190 U	230 U	170 U	
Polychlorinated Biphenyls [4]								
Aroclor-1016	40 U	41 U	46 U	45 U	38 U	44 U	33 U	16,800
Aroclor-1221	81 U	83 U	94 U	92 U	76 U	89 U	67 U	16,800
Aroclor-1232	40 U	41 U	46 U	45 U	38 U	44 U	33 U	16,800
Aroclor-1242	40 U	41 U	46 U	45 U	38 U	44 U	33 U	16,800
Aroclor-1248	40 U	41 U	46 U	45 U	38 U	44 U	33 U	16,800
Aroclor-1254	40 U	41 U	46 U	45 U	38 U	44 U	33 U	16,800
Aroclor-1260	40 U	41 U	1,400 D	45 U	38 U	44 U	33 U	16,800

Key:

J = The concentration is approximate since it was detected below the reportable quantitation limit
U = Compound was analyzed for but was not detected at or above the associated detection limit
D = This concentration is the result of analysis at a higher dilution factor
P = A difference of 25% or greater was found between the two columns. The lower of these concentrations is reported
E = This concentration should be considered an estimate since exceeded the instrument calibration range

[1] The laboratory reported the results of the original sample and a dilution. The results shown are either the highest positive results or the lowest detection limit.

[2] Blank spaces indicate that no Soil Treatment Action Level (STAL) has been established for that analyte.

[3] The STAL shown is for total chlordane.

[4] The STAL shown is for total polychlorinated biphenyls.

TABLE C-7

SHEEN ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
TEST PIT INVESTIGATION - MARCH 2002
MIDCO II SITE
GARY, INDIANA

Sample ID:	2TPA2P [1]	2TPA8P [1]	2TPAA3P
Test Pit No.:	A-2	A-8	A-3
Collection Date:	3/20/2002	3/21/2002	3/20/2002
Notes:			
Units:	µg/Kg	µg/Kg	µg/Kg
Acetone	3,400 JB	2,600 U	130,000 U
Benzene	5,200 U	200 J	130,000 U
Bromodichloromethane	5,200 U	2,600 U	130,000 U
Bromoform	5,200 U	2,600 U	130,000 U
Bromomethane	2,600 JB	2,100 JB	19,000 JB
2-Butanone	5,200 U	2,600 U	130,000 U
Carbon disulfide	5,200 U	2,600 U	130,000 U
Carbon tetrachloride	5,200 U	2,600 U	130,000 U
Chlorobenzene	5,200 U	2,600 U	130,000 U
Chloroethane	5,200 U	2,600 U	130,000 U
Chloroform	5,200 U	2,600 U	130,000 U
Chloromethane	1,200 JB	1,200 JB	14,000 JB
Cyclohexane	5,200 U	2,600 U	130,000 U
1,2-Dibromo-3-chloropropane	5,200 U	2,600 U	130,000 U
1,2-Dibromoethane	5,200 U	2,600 U	130,000 U
Dibromochloromethane	5,200 U	2,600 U	130,000 U
1,2-Dichlorobenzene	5,200 U	2,600 U	130,000 U
1,3-Dichlorobenzene	5,200 U	2,600 U	130,000 U
1,4-Dichlorobenzene	5,200 U	2,600 U	130,000 U
Dichlorodifluoromethane	5,200 U	2,600 U	130,000 U
1,1-Dichloroethane	5,200 U	450 J	130,000 U
1,2-Dichloroethane	5,200 U	2,600 U	130,000 U
1,1-Dichloroethene	5,200 U	2,600 U	130,000 U
cis-1,2-Dichloroethene	700 J	4,100	130,000 U
trans-1,2-Dichloroethene	5,200 U	2,600 U	130,000 U
1,2-Dichloropropane	370 J	660 J	130,000 U
cis-1,3-Dichloropropene	5,200 U	2,600 U	130,000 U
trans-1,3-Dichloropropene	5,200 U	2,600 U	130,000 U
Ethylbenzene	140,000	56,000	1,200,000
2-Hexanone	5,200 U	2,600 U	130,000 U
Isopropylbenzene	3,100 J	1,000 J	19,000 J
4-Methyl-2-pentanone	5,200 U	2,600 U	130,000 U
Methyl acetate	5,200 U	2,600 U	130,000 U
Methyl tert-butyl ether	5,200 U	2,600 U	130,000 U
Methylcyclohexane	3,800 J	3,000	32,000 J
Methylene chloride	370 J	790 J	7,900 J
Styrene	5,200 U	2,600 U	130,000 U
1,1,2,2-Tetrachloroethane	5,200 U	2,600 U	130,000 U
Tetrachloroethene	1,100 J	770 J	11,000 J
Toluene	130,000	100,000	1,000,000
1,2,4-Trichlorobenzene	5,200 U	2,600 U	130,000 U
1,1,1-Trichloroethane	5,200 U	2,600 U	130,000 U
1,1,2-Trichloroethane	5,200 U	2,600 U	130,000 U
Trichloroethene	1,200 JB	2,600 U	4,600 JB
Trichlorofluoromethane	5,200 U	2,600 U	130,000 U
1,1,2-trichloro-1,2,2-trifluoethane	680 J	780 J	130,000 U
Vinyl chloride	5,200 U	2,600 U	130,000 U
Xylene (Total)	400,000	150,000	3,500,000
Total VOCs	688,520	321,050	5,807,500

Key:

J = The concentration is approximate since it was detected below the reportable quantitation limit

U = Compound was analyzed for but was not detected at or above the associated detection limit

B = This compound was detected in the associated blank

VOCs = Volatile organic compounds

[1] The laboratory reported the results of the original sample and a dilution. The results shown are either the highest positive results or the lowest detection limit. Higher estimated positive results were disregarded if accurate positive results were detected.

TABLE C-8

"SHEEN SAMPLE" ANALYTICAL RESULTS - SEMIVOLATILE ORGANIC COMPOUNDS
TEST PIT INVESTIGATION - MARCH 2002
MIDCO II SITE
GARY, INDIANA

Sample ID:	2TPA2P	2TPAA3P	2TPA8P
Test Pit No.:	A-2	A-3	A-8
Collection Date:	3/20/2002	3/20/2002	3/20/2002
Notes:			
Units:	µg/Kg	µg/Kg	µg/Kg
Acenaphthene	2,100 J	10,000 U	2,300 J
Acenaphthylene	10,000 U	10,000 U	20,000 U
Acetophenone	10,000 U	10,000 U	20,000 U
Anthracene	3,600 J	10,000 U	4,000 J
Atrazine	10,000 U	10,000 U	20,000 U
Benzaldehyde	10,000 U	10,000 U	20,000 U
Benzo(a)anthracene	4,900 J	10,000 U	7,700 J
Benzo(a)pyrene	3,500 J	10,000 U	5,600 J
Benzo(b)fluoranthene	3,100 J	10,000 U	5,700 J
Benzo(g,h,i)perylene	1,800 J	10,000 U	2,900 J
Benzo(k)fluoranthene	3,200 J	10,000 U	4,400 J
1,1'-Biphenyl	650 J	10,000 U	820 J
Bis(2-chloroethoxy)methane	10,000 U	10,000 U	20,000 U
Bis(2-chloroethyl)ether	10,000 U	10,000 U	20,000 U
Bis(2-ethylhexyl)phthalate	18,000 B	950 JB	62,000 B
4-Bromophenyl phenyl ether	10,000 U	10,000 U	20,000 U
Butyl benzyl phthalate	1,500 J	10,000 U	2,900 J
Caprolactam	10,000 U	10,000 U	20,000 U
Carbazole	1,200 J	10,000 U	1,800 J
4-Chloroaniline	10,000 U	10,000 U	20,000 U
4-Chloro-3-methylphenol	10,000 U	10,000 U	20,000 U
2-Chloronaphthalene	10,000 U	10,000 U	20,000 U
2-Chlorophenol	10,000 U	10,000 U	20,000 U
4-Chlorophenyl phenyl ether	10,000 U	10,000 U	20,000 U
Chrysene	4,600 J	10,000 U	7,400 J
Dibenzo(a,h)anthracene	410 J	10,000 U	20,000 U
Dibenzofuran	1,700 J	10,000 U	1,500 J
3,3'-Dichlorobenzidine	10,000 U	10,000 U	20,000 U
2,4-Dichlorophenol	10,000 U	10,000 U	20,000 U
Diethyl phthalate	10,000 U	10,000 U	20,000 U
2,4-Dimethylphenol	10,000 U	10,000 U	20,000 U
Dimethyl phthalate	10,000 U	10,000 U	20,000 U
4,6-Dinitro-2-methylphenol	25,000 U	25,000 U	50,000 U
2,4-Dinitrophenol	25,000 U	25,000 U	50,000 U
2,4-Dinitrotoluene	10,000 U	10,000 U	20,000 U
2,6-Dinitrotoluene	10,000 U	10,000 U	20,000 U
Di-n-butyl phthalate	9,200 J	10,000 U	5,200 J
Di-n-octyl phthalate	18,000	10,000 U	31,000
Fluoranthene	15,000	10,000 U	22,000
Fluorene	2,400 J	10,000 U	2,900 J
Hexachlorobenzene	10,000 U	10,000 U	20,000 U

TABLE C-8

"SHEEN SAMPLE" ANALYTICAL RESULTS - SEMIVOLATILE ORGANIC COMPOUNDS
TEST PIT INVESTIGATION - MARCH 2002
MIDCO II SITE
GARY, INDIANA

Sample ID:	2TPA2P	2TPAA3P	2TPA8P
Test Pit No.:	A-2	A-3	A-8
Collection Date:	3/20/2002	3/20/2002	3/20/2002
Notes:			
Units:	µg/Kg	µg/Kg	µg/Kg
Hexachlorobutadiene	10,000 U	10,000 U	20,000 U
Hexachlorocyclopentadiene	10,000 U	10,000 U	20,000 U
Hexachloroethane	10,000 U	10,000 U	20,000 U
Indeno(1,2,3-cd)pyrene	2,100 J	10,000 U	3,500 J
Isophorone	10,000 U	10,000 U	20,000 U
2-Methylnaphthalene	7,000 J	10,000 U	15,000 J
2-Methylphenol	10,000 U	10,000 U	20,000 U
4-Methylphenol	10,000 U	530 J	20,000 U
Naphthalene	24,000	10,000 U	51,000
2-Nitroaniline	25,000 U	25,000 U	50,000 U
3-Nitroaniline	25,000 U	25,000 U	50,000 U
4-Nitroaniline	25,000 U	25,000 U	50,000 U
Nitrobenzene	10,000 U	10,000 U	20,000 U
2-Nitrophenol	10,000 U	10,000 U	20,000 U
4-Nitrophenol	25,000 U	25,000 U	50,000 U
N-Nitroso-di-n-propylamine	10,000 U	10,000 U	20,000 U
N-Nitrosodiphenylamine	910 J	10,000 U	2,600 J
2,2'-Oxybis(1-chloropropane)	10,000 U	10,000 U	20,000 U
Pentachlorophenol	25,000 U	25,000 U	50,000 U
Phenanthrene	15,000	10,000 U	21,000
Phenol	10,000 U	10,000 U	20,000 U
Pyrene	11,000	10,000 U	19,000 J
2,4,5-Trichlorophenol	25,000 U	25,000 U	50,000 U
2,4,6-Trichlorophenol	10,000 U	10,000 U	20,000 U
Total SVOCs	154,870	1,480	282,220

Key:

J = The concentration is approximate since it was detected below the reportable quantitation lir
U = Compound was analyzed for but was not detected at or above the associated detection limit
B = This compound was detected in the associated blank

TABLE C-9

"SHEEN SAMPLE" ANALYTICAL RESULTS - CHLORINATED PESTICIDES/POLYCHLORINATED BIPHENYLS
TEST PIT INVESTIGATION - MARCH 2002
MIDCO II SITE
GARY, INDIANA

Sample ID:	2TPA2P	2TPAA3P	2T9A8P
Test Pit No:	A-2	A-3	A-8
Collection Date:	3/20/2002	3/20/2002	3/20/2002
Notes:			
Units:	µg/Kg	µg/Kg	µg/Kg
Pesticides			
Aldrin	51 U	51 U	51 U
alpha-BHC	51 U	34 JP	51 U
beta-BHC	51 U	51 U	51 U
delta-BHC	51 U	51 U	51 U
gamma-BHC (Lindane)	51 U	51 U	51 U
alpha Chlordane	51 U	51 U	51 U
gamma Chlordane	51 U	51 U	51 U
4,4'-DDD	99 U	99 U	99 U
4,4'-DDE	99 U	99 U	99 U
4,4'-DDT	99 U	99 U	99 U
Dieldrin	99 U	99 U	99 U
Endosulfan I	51 U	51 U	51 U
Endosulfan II	99 U	99 U	99 U
Endosulfan sulfate	99 U	99 U	99 U
Endrin	99 U	99 U	99 U
Endrin aldehyde	99 U	99 U	99 U
Endrin ketone	99 U	99 U	99 U
Heptachlor	51 U	51 U	51 U
Heptachlor epoxide	51 U	51 U	51 U
Methoxychlor	510 U	510 U	510 U
Toxaphene	5,100 U	5,100 U	5,100 U
Polychlorinated Biphenyls			
Aroclor-1016	990 U	990 U	990 U
Aroclor-1221	2,000 U	2,000 U	2,000 U
Aroclor-1232	990 U	990 U	990 U
Aroclor-1242	990 U	990 U	990 U
Aroclor-1248	990 U	990 U	990 U
Aroclor-1254	990 U	990 U	990 U
Aroclor-1260	990 U	990 U	990 U

Key:

J = The concentration is approximate since it was detected below the reportable quantitation limit

U = Compound was analyzed for but was not detected at or above the associated detection limit

P = A difference of 25% or greater was found between the two columns. The lower of these concentrations is reported

TEST PIT LOG
Test Pit No. A1

Project:	MIDCO II
Location:	5900 Industrial Drive Gary, Indiana
Project No:	218601W
Date:	March 20, 2002
Logged by:	C. Bonczkiewicz
Excavation by:	T. Claus
Excavation Equip:	580 Backhoe-loader

Test Pit Observations

Depth (from surface)	**Soil Description**
All depths are approximate; soil strata changes may be gradual	
0 - 1 ft	Silty clay, little gravel, brown and gray
1 - 6 ft	Slag, mostly 0.5 to 1 inch sizes, gray

Notes: water at - 5 ft
water clear, no sheen
(no water or soil sample taken)

backfilled with excavated soil after sampling

TEST PIT LOG
Test Pit No. AA3

Project:	MIDCO II
Location:	5900 Industrial Drive Gary, Indiana
Project No:	218601W
Date:	March 21, 2002
Logged by:	C. Bonczkiewicz
Excavation by:	T. Claus
Excavation Equip:	580 Backhoe-loader

Test Pit Observations

Depth (from surface)	**Soil Description**
All depths are approximate; soil strata changes may be gradual	
0 - 0.5 ft	Silty clay, trace roots, brown
0.5 - 3 ft	Silty sand, trace clay, gray
3 - 4 ft	Fine sand, trace silt, brown
4 - 7.5 ft	Silty fine to medium sand, trace wood, roots, metal pieces soil sample obtained from -6.5 ft for analaysis
Notes:	water at 6.5 ft No floating product layer water sample (brown) obtained for analysis
	"product" sample obtained by skimming the surface water after test pit was open for approx. 1 hour
	backfilled with excavated soil after sampling

TEST PIT LOG
Test Pit No. A -2

Project:	MIDCO II
Location:	5900 Industrial Drive Gary, Indiana
Project No:	218601W
Date:	March 21, 2002
Logged by:	C. Bonczkiewicz
Excavation by:	T. Claus
Excavation Equip:	580 Backhoe-loader

Test Pit Observations

Depth (from surface)	**Soil Description**
All depths are approximate; soil strata changes may be gradual	
0 - 1 ft	Silty clay, brown
1 - 4 ft	Silty to clayey sand,with metal wood, and brick, black to dark gray
4 - 8.5 ft	Fine to medium sand, saturated below 7.5 ft soil sample obtained from -5 ft and approx. -7.5 ft for analysis test pit caving below 8.5 ft
Notes:	water at 7.5 ft brown and dark brown at water surface; attempted to skim surface for "product" sample water samples also obtained for analysis
	backfilled with excavated soil after sampling

TEST PIT LOG
Test Pit No. A7

Project:	MIDCO II
Location:	5900 Industrial Drive Gary, Indiana
Project No:	218601W
Date:	March 21, 2002
Logged by:	C. Bonczkiewicz
Excavation by:	T. Claus
Excavation Equip:	580 Backhoe-loader

Test Pit Observations

Depth (from surface)	**Soil Description**
All depths are approximate; soil strata changes may be gradual	
0 - 1.5 ft	Silty sand, brown
1.5 - 4.5 ft	Fine sand, trace silt, gray and slightly brown
4.5 - 5 ft	Silty sand, brown
5 - 7.5 ft	Silty fine to medium sand with flyash, trace wood, concrete and brick, gray to dark gray, tar-like odor
Notes:	water at 7.5 ft water was gray in color with sheen and tar odor No floating product layer water samples obtained after 2 hours
	backfilled with excavated soil after sampling

TEST PIT LOG
Test Pit No. A8

Project:	MIDCO II
Location:	5900 Industrial Drive Gary, Indiana
Project No:	218601W
Date:	March 20, 2002
Logged by:	C. Bonczkiewicz
Excavation by:	T. Claus
Excavation Equip:	580 Backhoe-loader

Test Pit Observations

Depth (from surface)	**Soil Description**
All depths are approximate; soil strata changes may be gradual	
0 - 1.5 ft	Silty clay and topsoil, brown
1.5 - 7 ft	Fly ash fill, with slag, brick, tar, wood and plastic also noted below -5 ft. Concrete obstruction at -6.5 ft Solvent odor
7 - 10 ft	Clayey sand, trace flyash and tar-like material. Wet below 7.5 ft soil sample obtained for analysis from below 7.5 ft
Notes:	water at - 9.75 ft liquid in test pit was black, with tar-like odor
	water and "product" samples obtained for analysis no floating product layer visable after 5 hours
	backfilled with excavated soil after sampling

TEST PIT LOG
Test Pit No. B3

Project:	MIDCO II
Location:	5900 Industrial Drive Gary, Indiana
Project No:	218601W
Date:	March 20, 2002
Logged by:	C. Bonczkiewicz
Excavation by:	T. Claus
Excavation Equip:	580 Backhoe-loader

Test Pit Observations

Depth (from surface)	**Soil Description**
All depths are approximate; soil strata changes may be gradual	
0 - 1.5 ft	Sandy clay, rust brown
1.5 - 4 ft	Fine sand and silty sand, with concrete pieces
4 - 6 ft	Silty sand, trace gravel, brown and partly gray; odors in -5 to -6 ft interval
6 - 9 ft	Fine sand, trace silt, gray Saturated below 7 ft
Notes:	water at -8.5 ft after about 15 minutes No floating product layer; however sheen noted on water water sample (brown) obtained for analysis after 30 minutes
	backfilled with excavated soil after sampling

TEST PIT LOG
Test Pit No. C5

Project:	MIDCO II
Location:	5900 Industrial Drive Gary, Indiana
Project No:	218601W
Date:	March 21, 2002
Logged by:	C. Bonczkiewicz
Excavation by:	T. Claus
Excavation Equip:	580 Backhoe-loader

Test Pit Observations

Depth (from surface)	**Soil Description**
All depths are approximate; soil strata changes may be gradual	
0 - 1.7 ft	Silty sand, trace clay, roots and gravel, rust brown
1.7 - 3.8 ft	Fine sand and silty sand, with brick, plastic and concrete, brown
3.8 - 6.5 ft	Fine sand, light brown
6.6 - 9 ft	Fine sand, trace silt, dark gray and brown; saturated below 7.5 ft soil sample obtained for analysis at approx. -7.5 ft
Notes:	water at approx. 8 ft No floating product layer No odor or sheen on water water sample (lt brown) obtained for analysis
	backfilled with excavated soil after sampling

TEST PIT LOG
Test Pit No. C8

Project:	MIDCO II
Location:	5900 Industrial Drive Gary, Indiana
Project No:	218601W
Date:	March 20, 2002
Logged by:	C. Bonczkiewicz
Excavation by:	T. Claus
Excavation Equip:	580 Backhoe-loader

Test Pit Observations

Depth (from surface)	**Soil Description**
All depths are approximate; soil strata changes may be gradual	
0 - 1 ft	Silty sand, trace clay and gravel, rust brown
1 - 3 ft	Fine to medium sand, little silt, with brick, wood concrete, metal and slag pieces. Brick layer at -3 ft.
3 - 7 ft	Silty sand and fine sand, trace concrete, dark gray
7 - 11 ft	Fine sand and silty sand, light brown. Wet below 8 ft
Notes:	water at approx. -10 ft, but test pit was caving below -8 ft No floating product layer water sample obtained for analysis after 1 hour
	backfilled with excavated soil after sampling

TEST PIT LOG
Test Pit No. D8

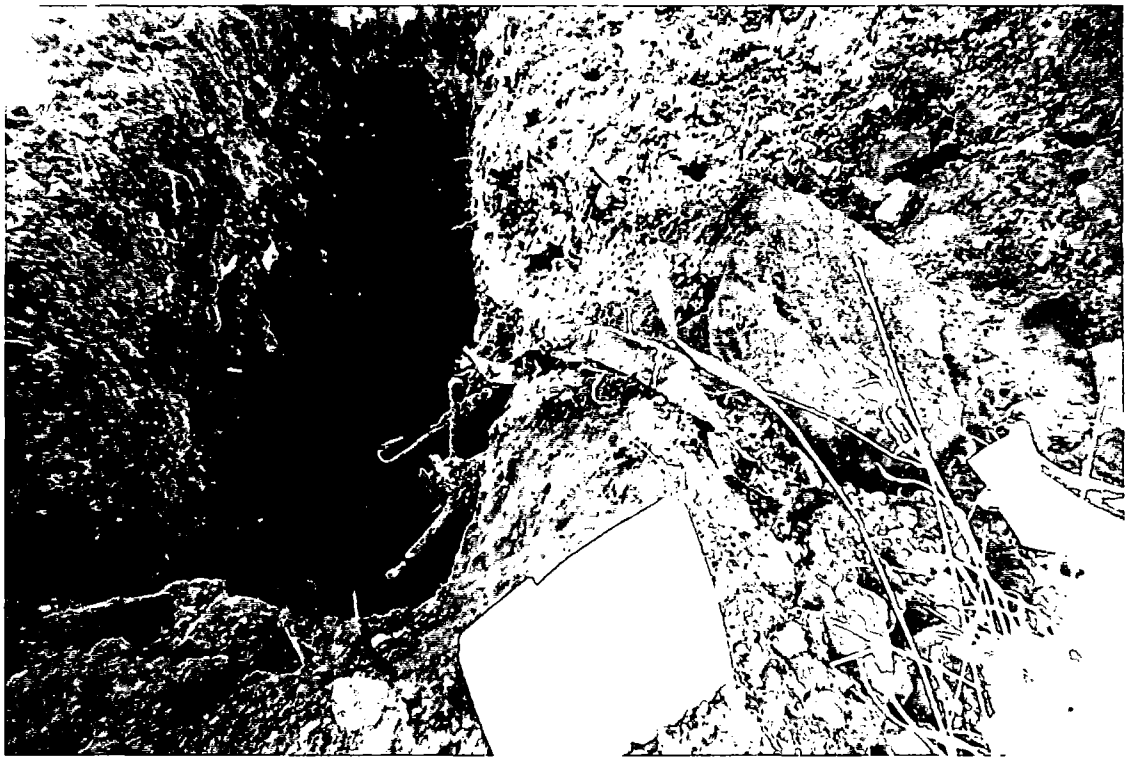
Project:	MIDCO II
Location:	5900 Industrial Drive Gary, Indiana
Project No:	218601W
Date:	March 20, 2002
Logged by:	C. Bonczkiewicz
Excavation by:	T. Claus
Excavation Equip:	580 Backhoe-loader

Test Pit Observations

Depth (from surface)	**Soil Description**
All depths are approximate; soil strata changes may be gradual	
0 - 3 ft	Silty to sandy clay, trace gravel, rust brown
3 - 4 ft	Fly ash fill, with wood, and other debris, gray
4 - 10 ft	Fine sand, trace silt and debris, light brown soil sample obtained for analysis from below 7.5 ft
Notes:	water at -9 ft water in test pit was black; no floating product layer water sample obtained for analysis
	backfilled with excavated soil after sampling

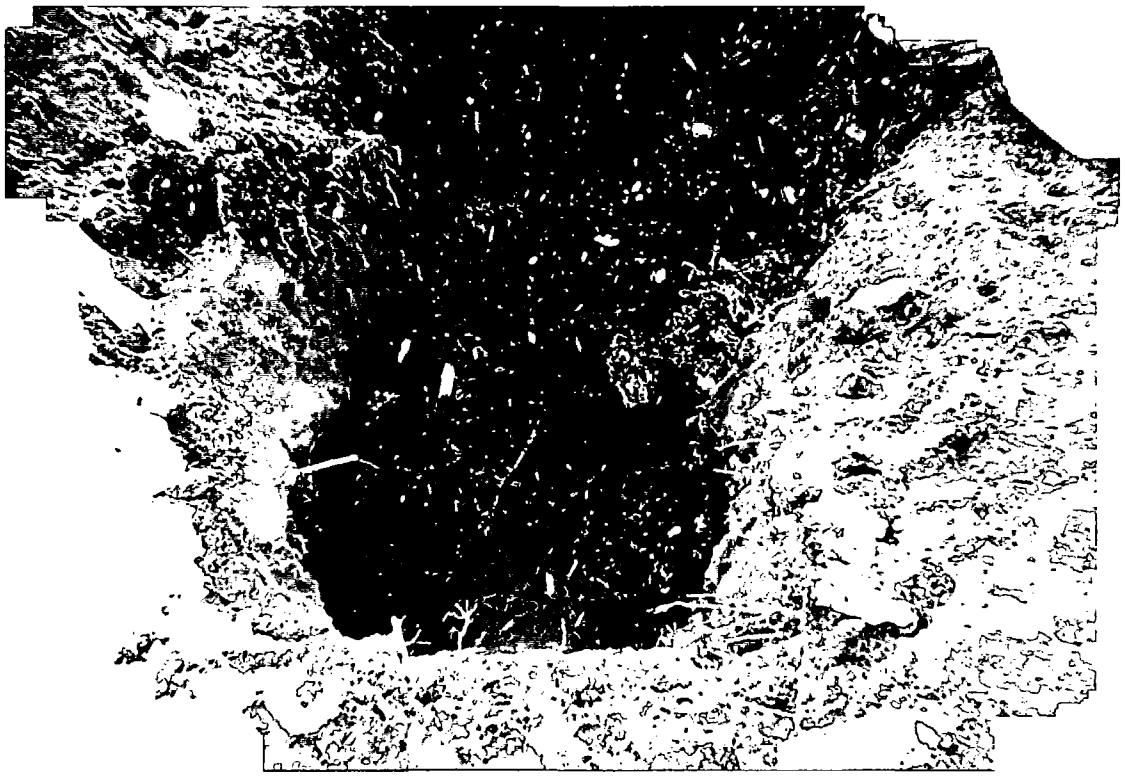
Midco II Test Pits

Test Pit A-1



Test Pit A-2

Midco II Test Pits



Test Pit AA-3

Test Pit A-7

Midco II Test Pits

Test Pit A-8

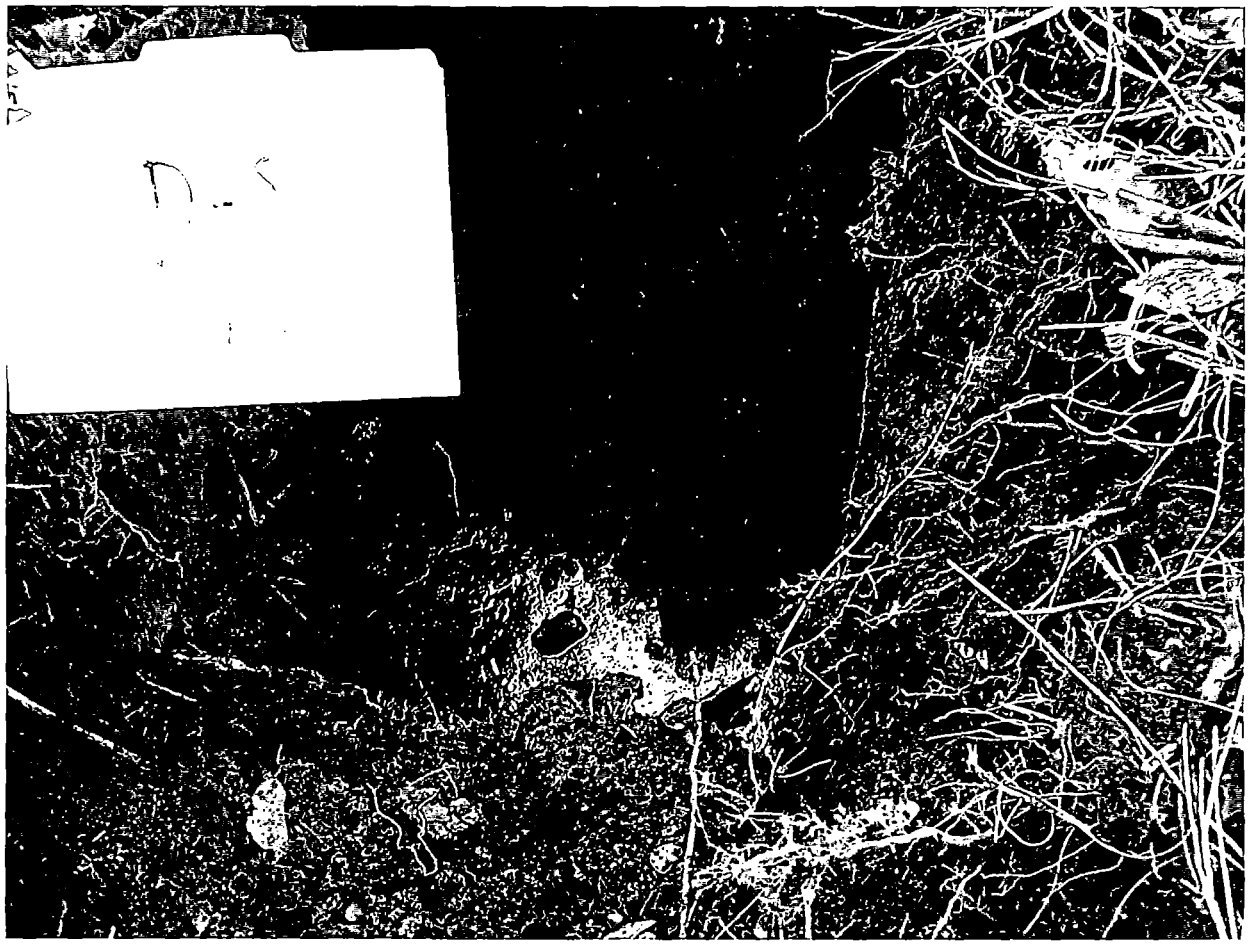
Test Pit B-3

Midco II Test Pits

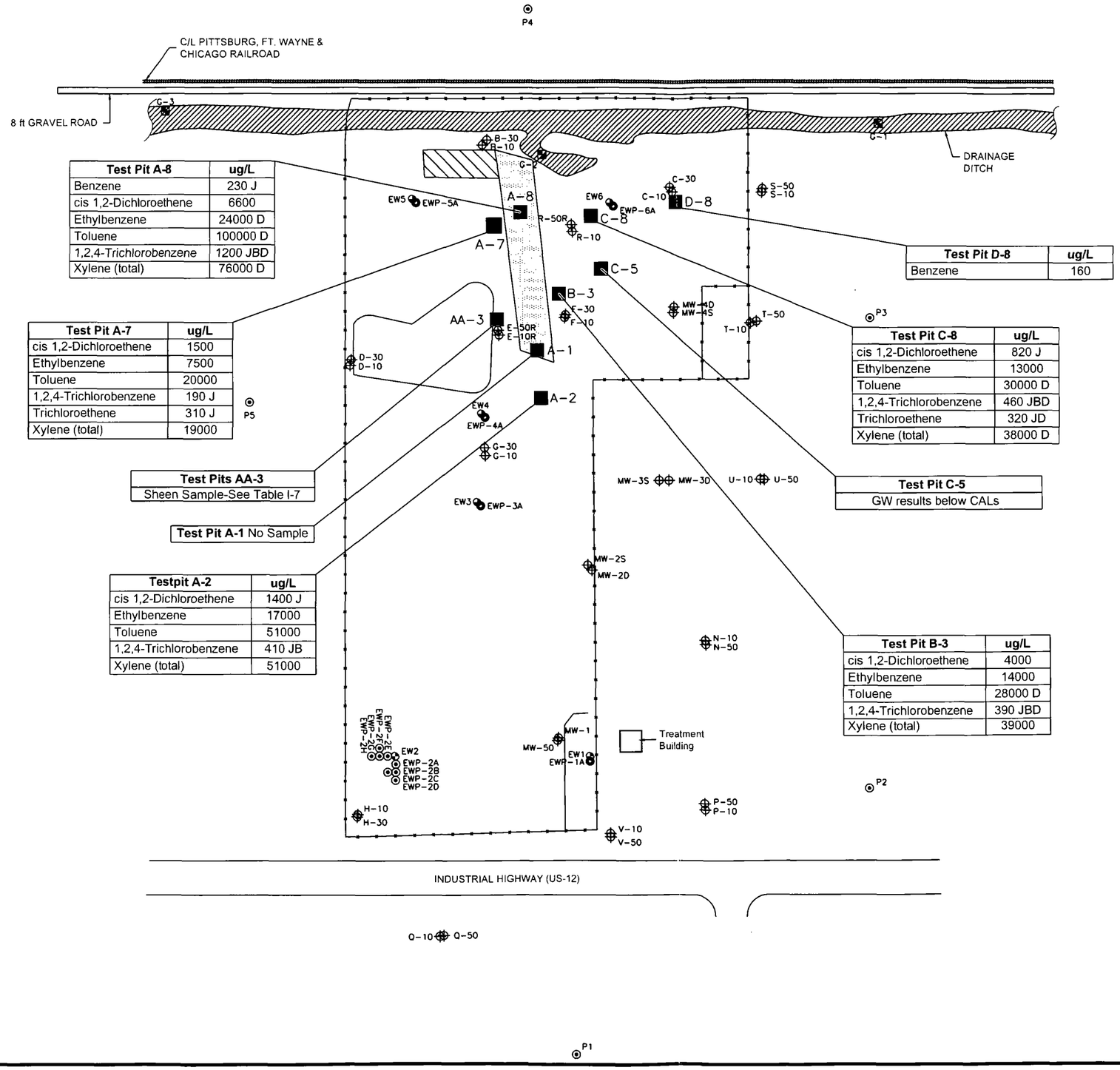
Test Pit C-5

Test Pit C-8

Midco II Test Pits



Test Pit D-8



Test Pit A-8	ug/L
Benzene	230 J
cis 1,2-Dichloroethene	6600
Ethylbenzene	24000 D
Toluene	100000 D
1,2,4-Trichlorobenzene	1200 JBD
Xylene (total)	76000 D

Test Pit D-8	ug/L
Benzene	160

Test Pit A-7	ug/L
cis 1,2-Dichloroethene	1500
Ethylbenzene	7500
Toluene	20000
1,2,4-Trichlorobenzene	190 J
Trichloroethene	310 J
Xylene (total)	19000

Test Pit C-8	ug/L
cis 1,2-Dichloroethene	820 J
Ethylbenzene	13000
Toluene	30000 D
1,2,4-Trichlorobenzene	460 JBD
Trichloroethene	320 JD
Xylene (total)	38000 D

Test Pits AA-3
Sheen Sample-See Table I-7

Test Pit A-1 No Sample

Test Pit C-5
GW results below CALs

Testpit A-2	ug/L
cis 1,2-Dichloroethene	1400 J
Ethylbenzene	17000
Toluene	51000
1,2,4-Trichlorobenzene	410 JB
Xylene (total)	51000

Test Pit B-3	ug/L
cis 1,2-Dichloroethene	4000
Ethylbenzene	14000
Toluene	28000 D
1,2,4-Trichlorobenzene	390 JBD
Xylene (total)	39000

LEGEND

- Fence
- Extraction Well Location
- Monitoring Well Location
- Piezometer Location
- Staff Gauge Location
- Test Pit Location-March 2002
- Former Filter Bed Area

APPROX. SCALE (ft.)
0 150

Midco Altern. Remedy\wkplan append.\Appendix C\Test Pit Locations & GW Data

ENVIRON
650 DUNDEE ROAD, SUITE 150, NORTHBROOK, IL 60062

Test Pit Locations (& GW Data above CALs)
March 2002
Midco II Site
Gary, Indiana

DATE	CONTRACT NUMBER		FIGURE
5/08/02	21-8601W		C-1
DRAFTER: APR	APPROVED:	REVISED	

APPENDIX D

Modification of Site Specific Ambient Water Quality Criteria

APPENDIX D
MODIFICATION OF THE SITE-SPECIFIC AMBIENT WATER QUALITY CRITERIA

A. Objectives

This appendix presents the methodology followed to calculate revised site-specific factors to modify the site-specific ambient water quality criteria (AWQC), which constitute one of the Site's ground water clean-up action levels (CALs). As a result of the modifications of the AWQC, the CALs were also re-evaluated. Since the 1993 ground water sampling, several off-site monitoring wells have exceeded the CALs only as a result of exceedance of the AWQC. The modification was based on MRC's belief that the original calculation of the site-specific AWQC for the Midco I Site was too conservative and that the basis for the calculation of the site-specific AWQC for the Midco II Site has changed. Therefore, the off-site concentrations detected above the current AWQC are actually not producing a risk to the environment. The basis for the original site-specific AWQC and the basis and results of the modified AWQC analysis are presented in the next sections.

B. Basis for the Original Site-Specific AWQC

The proposed revisions to the site-specific AWQC result from the fact that the surface water body receiving ground water from each Site is different than originally perceived. For the Midco I Site, the site-specific AWQC was based on flow of ground water to the pond directly north of the Site, next to the Ninth Avenue Site. In fact, the ground water at the Midco I Site flows to the northeast, and the more likely receptor for the off-site wells is the Grand Calumet River, located approximately 8,000 feet from the Site in a northeast direction. The site-specific factor used in the SOW was really not applicable to the entire Site's aquifer.

For the Midco II Site, the site-specific factor was based on flow of ground water to the ditch located northwest of the Site. The ditch was originally a receptor of the northern portion of the Midco II ground water, but the ground water flow direction has changed since about 1996, and it now flows to the south, towards the Grand Calumet

River, located approximately 4,000 feet from the Site. As a result, the site-specific factor used in the SOW is no longer appropriate for the Midco II Site.

The factors used to establish the site-specific AWQC in the SOW were calculated as follows:

- Midco I Site: The width of the Site in the east-west direction divided by the length of the pond. This calculation was used to resolve the issue that a flow rate was not available for the pond, which is stagnant most of the year. This pond only discharges to the nearby storm sewer when it overflows during rain events. This calculation is also consistent with the approach taken for the Midco II Site.
- Midco II Site: The width of the Site parallel to the ditch divided by the length of the ditch upstream and up to the northeast corner of the Site. This approach was used to account for the discharge of ground water from other sources upstream of the Site.

C. Procedure and Calculation Results for the Modified AWQC

The factors used to determine the site-specific AWQC were calculated as the ratio of the river's flow rate to each Site's flow rate. The river's flow rate was obtained from the United States Geological Survey to be approximately 500 cubic feet per second or 43.2 million cubic feet per day (Page 6-62 of the *Midco II Remedial Investigation Report*, March 1988). The flow rate for each Site was calculated as the ground water velocity times the depth of the aquifer times the width of each Site in a direction perpendicular to the ground water flow direction. The Midco I and Midco II Sites' flow rates were calculated to be 0.0075 and 0.0061 million cubic feet per day, respectively, corresponding to dilution factors of 5,800 and 7,100. The results of the calculations are presented in Table D-1, and the equation, data used, and sources of the data are listed in Table D-2.

Table D-1 also presents the original and modified site-specific AWQC and CALs. As indicated in the SOW, the CALs include: (1) a cumulative carcinogenic risk of 1 x

10^{-5}, (2) a cumulative noncarcinogenic hazard index of 1, (3) the most recent federal drinking water MCLs, and (4) the site-specific AWQC, calculated as the federal chronic freshwater AWQC multiplied by a site-specific factor. The SOW also specifies that the CAL cannot be less than the background concentrations listed in Table 1 of Attachment 2 of the SOW or the project-specific detection limits, which were later listed in the Remedial Design/Remedial Action Quality Assurance Project Plan. Therefore, modifications to the CALs must take into account the other two set of limits.

The CALs shown in Table D-1 were calculated as if each parameter was present in the ground water by itself (i.e., cumulative risks are not considered; as an example, the calculated risk-based concentration for benzene represents the concentration that would produce the entire 1 x 10^{-5} carcinogenic risk allowable in the ground water at each Site according to the SOW). As indicated by the shading in Table D-1, the revised site-specific factors result in significant modifications in the AWQC and CALs for the following parameters:

- Midco I Site: Cadmium, copper, cyanide, iron, lead, mercury, silver, and hexavalent chromium.
- Midco II Site: Copper, cyanide, iron, lead, mercury, silver, and hexavalent chromium.

D. Evaluation of the Effect of Modifying the Site-Specific AWQC on Compliance with the CALs

The modifications to the CALs shown in Table D-1 would result in a greater number of sampling locations having met all of the CALs for three consecutive years, as required by the SOW for dropping the location from the set of wells to be monitored annually. The annual ground water monitoring reports for 1993, 1996, 1997, and 1999 through 2001 were reviewed to evaluate this issue. The first three years of monitoring (1993, 1996, and 1997) were evaluated because those were the only years when organic parameters other than VOCs have been analyzed in the ground water samples. Only VOCs and inorganics (Target Analyte List, sulfide, and hexavalent chromium) have been

analyzed since 1998. Besides the VOCs, the site-specific organic parameters include: direct injection volatiles, semivolatile organic compounds (SVOCs), polynuclear aromatic hydrocarbons, chlorinated pesticides, polychlorinated biphenyls, herbicides, and organophosphorus pesticides.

The evaluation consisted of determining which monitoring locations would meet the VOC and inorganic CALs for the 1999, 2000, and 2001 annual ground water monitoring events by using the revised CALs and which monitoring locations may have to be sampled for the other organics in order to meet the SOW requirements for deletion of monitoring locations (i.e., the monitoring location has to meet all of the CALs for three consecutive years). We believe that the three initial years of sampling (1993, 1996, and 1997), although not strictly consecutive, are sufficient to demonstrate that the SOW requirements are met if none of the other organics was detected above the CALs, especially because no migration of VOCs (which are more mobile that the rest of the organics that have not been analyzed since 1998) has been detected in the locations that would be deleted from the monitoring network. Table D-3 includes a summary of the evaluation, and Figures A-1 and A-2 in Appendix A present the monitoring locations.

1. Midco I Site

Of the 26 off-site downgradient locations (i.e., those outside the proposed slurry wall and downgradient of the Midco I Site), seven additional locations (six monitoring wells and one piezometer) would meet the VOC and inorganic CALs in 2001, for a total of 18 off-site downgradient monitoring locations meeting the VOC and inorganic CALs in 2001. Also, a total of 17 off-site downgradient and side-gradient monitoring locations would have met all of the CALs for VOCs and inorganics in the past three years (versus five when using the current AWQC), and 15 of those would have met the CALs for the rest of the organics in 1993, 1996, and 1997. In accordance with the SOW, these 15 off-site wells (i.e., MW-11D, A-10, A-30, H-10, K-10, K-30, M-10, M-30, N-10, O-10, P-30, R-10, R-30, Q-10, and Q-30) can be deleted from the monitoring well network once the new AWQC are approved. Some of these wells may be retained for further sampling (such as N-10) to provide data from the downgradient area of the capture zone at the Midco I Site.

In addition, if ground water samples from L-10 and L-30 are analyzed for the other organics for the next 3 years and no other organics are detected, these two locations could also be eliminated from the monitoring network based on the SOW requirements. This would reduce the number of off-site monitoring locations to be sampled in the future to 11 locations versus the 28 sampled since 2000 or the 26 sampled since 1993.

We expect that pumping off site for a year after installation of the slurry wall and cut-off of any inorganics source will result in relatively rapid removal of inorganics, but that will only occur if there are no sources of these inorganics outside of the slurry wall. If the wetland filling and liquid dumping activities being conducted by the Midco neighbor to the east, Mr. Heine, have caused contamination of the aquifer by heavy metals, pumping in this area may pull in those heavy metals and prevent achieving the CALs on the northeast portion of the Site. A balance between this drawing of off-site ground water and the cleanup of the impacted off-site wells has to be achieved, through careful evaluation of the ground water quality in the area as the ground water extraction system is operated. If there are no other off-site sources, a natural attenuation petition could be made at some point in the future once the on-site sources have been either removed or controlled.

2. Midco II Site

The modified site-specific AWQC increase the number of wells meeting the VOC and inorganic CALs by two in 2001, for a total of six off-site monitoring locations meeting the VOC and inorganic CALs in 2001. Of those six, only four would meet the VOC and inorganic CALs for three consecutive years once the modified AWQC are approved. One of these four wells, Q-10, will likely require continued monitoring because it is the only shallow location in the monitoring network which is directly downgradient of the Site (i.e., across the street within the airport). Another of these four wells, MW-3S, contained one SVOC above the CALs in 1993, and would require sampling for the other organics for three

consecutive years before it could be deleted from the monitoring network in accordance to the SOW.

The absence of elevated levels of arsenic and barium in most of the shallow wells and the presence of elevated levels of arsenic and barium in all deep wells except for piezometer P-2 (which is located southeast of the Site) indicate that these chemicals are either naturally occurring in the area or there are other sources besides the Midco II soils. For example, arsenic concentrations have remained relatively constant in most of the deep wells over the last six years.

E. Summary

The site-specific AWQC should be modified to reflect current conditions. Upon modification based on the discharge of ground water from both sites to the Grand Calumet River, an additional 15 off-site locations at the Midco I Site and two off-site locations at the Midco II Site would have met all of the CALs for three consecutive years. Therefore, these 17 wells would have met the SOW requirements for deletion of wells from the monitoring network, and don't need to be sampled in the future.

TABLE D-1

MODIFIED SITE-SPECIFIC AMBIENT WATER QUALITY CRITERIA AND CLEAN-UP ACTION LEVELS[1]
MIDCO I AND II SITES, GARY, INDIANA

	Background		*Project-Specific*		*AWQC*		*Original SOW AWQC x F*		*Modified AWQC x Frev* [2]		*Risk-Based*	*Risk-Based*	*SOW's Parameter-Specific CAL* [3]		*Modified Parameter-Specific CAL* [3]	
Parameter	*Midco I*	*Midco II*	*QL*	*MCL*	*Midco I*	*Midco II*	*Midco I*	*Midco II*	*Midco I*	*Midco II*	*Carc.*	*Noncarc.*	*Midco I*	*Midco II*	*Midco I*	*Midco II*
Antimony			1	6								12.9	6	6	6	6
Arsenic	6	15.1	2	10	48	48	187	173	276,877	342,871	0.18	32.4	10	15.1	10	15.1
Barium	118	107	20	2,000								1,620	1,620	1,620	1,620	1,620
Beryllium			1	4	5.3	5.3	20.7	19.1	30,649	37,855		162	4	4	4	4
Cadmium		0.15	1	5	1.2	2.9	4.68	10.4	6,929	20,612		32.4	4.68	5	5	5
Chromium (III) [4]	8	7.5	1	100	220	558	858	2,010	1,270,376	3,983,649		32,400	100	100	100	100
Copper		25.2	1		13	33	50.7	120	75,068	237,830			50.7	120	75,100	237,800
Iron	3,880	15,300	50		1,000	1,000	3,900	3,600	5,774,436	7,134,894			3,900	15,300	5,770,000	7,130,000
Lead		5.6	1		3.5	15	13.7	53.6	20,285	106,231			13.7	53.6	20,300	106,200
Manganese	1,400	464	25									6,470	6,470	6,470	6,470	6,470
Mercury		0.25	0.2	2	0.012	0.012	0.0468	0.0432	69	86		9.71	0.20	0.25	2	2
Nickel	58	12.3	7		168	439	655	1,580	969,809	3,131,426		647	647	647	647	647
Selenium			2	50	35	35	137	126	202,846	249,721		97.1	50	50	50	50
Silver		4.6	1		0.12	0.12	0.468	0.432	693	856			1	4.6	693	856
Thallium			3	2	40	40	156	144	230,977	285,396		2.27	3	3	3	3
Vanadium	4.33		1									227	227	227	227	227
Zinc		1,470	1		341	878	1,330	3,160	1,969,231	6,262,851		6,470	1,330	3,160	6,470	6,470
Cyanide	10.4	158	10	200	5.2	5.2	20.3	18.7	30,057	37,062		647	20.3	158	200	200
Chromium (VI) [4]	8	7.5	10	100	11	11	42.9	39.6	63,519	78,484		162	42.9	39.6	100	100

Key:

AWQC x F = Site-specific chronic ambient water quality criteria (AWQC), equal to the federal chronic AWQC for protection of aquatic life times the site-specific factor F; from Table 2 of Attachment 2 of the Midco I and II Statement of Work, dated June 1992

Background = Site-specific background ground water concentrations; from Table 1 of Attachment 2 of the Midco I and II Statement of Work, dated June 1992

Blank = No value available or not applicable

CAL = Clean-up Action Level

Carc. = Carcinogenic risk-based concentration equivalent to 1E-05 carcinogenic risk for the individual parameter

Frev = Revised site-specific factor

MCL = Primary maximum contaminant level, from 40 CFR 141, as of May 2002

Noncarc. = Noncarcinogenic risk-based concentration equivalent to 1 noncarcinogenic hazard index for the individual parameter

QL = Quantitation Limit

= Modified based on revised site-specific AWQC

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[1] All concentrations are given in micrograms per liter.

[2] The data and equations used to calculate Frev are summarized in Table 10-2.

[3] Lowest value between the MCL, AWQC, and the risk-based concentrations calculated as if the parameter was the only parameter detected in the sample, but not less than the project-specific detection limit or the site-specific background concentrations. The risk-based concentrations were calculated by following the procedures in Attachment 2 of the Midco I and Midco II Statement of Work, dated June 1992.

[4] The maximum contaminant level applies to both chromium species.

TABLE D-2
DATA USED TO CALCULATE THE SITE-SPECIFIC FACTORS
TO USE WITH THE SITE-SPECIFIC AMBIENT WATER QUALITY CRITERIA
MIDCO I AND MIDCO II SITES, GARY, INDIANA

Parameter	*Unit*	*Symbol*	*Midco I*	*Midco II*	*Source/Reference*
Hydraulic conductivity	ft/day	k	26.6	34.5	2001 pump test results, provided by Environ
Hydraulic gradient	ft/ft	i	0.005	0.0013	Page 4-31 of the Midco I RI and Page 4-30 of the Midco II RI
Effective porosity	cu.ft./cu.ft.	n	0.2	0.2	Page 4-31 of the Midco I RI and Page 4-30 of the Midco II RI
Grand Calumet River flow rate	cu.ft./s	Q gcr'	500	500	Page 6-62 of the Midco II RI
Grand Calumet River flow rate	cu.ft./day	Q gcr	43,200,000	43,200,000	Calculated (Q gcr' * 86,400 s/d)
Width of plume	ft	w	450	600	Site's width perpendicular to the flow direction
Aquifer's depth	ft	d	25	45	Approximate, based on boring logs
Site's flow rate	cu.ft./day	Q site	7,481	6,055	Calculated (k * i * w * d / n)
Revised site-specific factor	unitless	Frev	5,774	7,135	Calculated (Q gcr / Q site)

Key:
RI = Remedial Investigation

$$Q = v \cdot A$$

$$v = \frac{k i'}{n}$$

$$A = w * d * n$$

$$Q = \frac{k i}{n} * w * d * n = k i * w * d$$

TABLE D-3

SUMMARY OF COMPLIANCE WITH THE MODIFIED CALs
MIDCO I AND MIDCO II SITES, GARY, INDIANA
(Page 1 of 2)

Midco I Site						
	Other Organics Detected			*Location Met the CALs*		
Monitoring Location	*1993*	*1996*	*1997*	*2001*	*2000*	*1999*
On-Site Monitoring Locations						
MW-2S			CPest		XI	XI
MW-2D					X	XI
MW-3S						X
MW-3D						XC
MW-4S		PCP			M	X
MW-4D				M	XI	XI
MW-5S						
MW-5D	CPest				XI	XI
MW-6S						
MW-6D				XI	XI	
C-10	PCP				M	M
C-30						XI
D-10						
D-30				X	XI	XI
Off-Site, Side-Gradient Monitoring Locations						
Q-10				X	M	M
Q-30				M	M	M
Off-Site, Downgradient Monitoring Locations						
MW-11S	PAHs		PAHs		X	X
MW-11D				X	X	X
A-10				X	M	X
A-30				X	X	X
B-10					M	
B-30					XI	XI
G-10						
G-30						
H-10				XI	M	M
H-30						
K-10				XI	M	X
K-30				XI	M	XI
L-10	PAHs			X	XI	X
L-30	PAHs			M	M	XI
M-10				M	M	M
M-30				X	X	X
N-10				X	XC	X
N-30						
0-10				XI	XI	X
0-30				X		
P-10						
P-30				X	X	X
R-10				X	X	X
R-30				X	M	M
P-1				X	X	NS
P-4					X	NS
P-4-shallow				XI		NS
Off-Site, Downgradient Locations Meeting VOCs and Inorganic CALs before AWQC Modification				11	8	11
Off-Site, Downgradient Locations Meeting VOCs and Inorganic CALs after AWQC Modification				18	20	17
Off-Site Locations Meeting VOCs and Inorganic CALs for 3 Consecutive Years				17	NA	NA

Key:

Blank = No other organics detected or the location did not meet all of the CALs
CPest = Chlorinated pesticides
M = Met the VOCs and inorganics CALs after modifying the site-specific ambient water quality criteria
NA = Not applicable
NS = Not sampled
PAHs = Polynuclear aromatic hydrocarbons
PCBs = Polychlorinated biphenyls
PCP = Pentachlorophenol
X = Met the VOCs and inorganics CALs; from the 2001 Annual Ground Water Monitoring Report
XI = Met the VOCs and inorganics CALs except for iron; from the 2001 Annual Ground Water Monitoring Report
XC = Conditionally met the VOCs and inorganics CALs because of high detection limits; from the 2001 Annual Ground Water Monitoring Report

TABLE D-3

SUMMARY OF COMPLIANCE WITH THE MODIFIED CALs
MIDCO I AND MIDCO II SITES, GARY, INDIANA
(Page 2 of 2)

Midco II Site						
Monitoring Location	*Other Organics Detected*			*Location Met the CALs*		
	1993	*1996*	*1997*	*2001*	*2000*	*1999*
On-Site Monitoring Locations						
MW-1						
MW-50						
MW-2S					X	X
MW-2D						
MW-4S	PAHs			XI		
MW-4D						
B-10					X	XC
B-30						
C-10	PAHs	PAHs, PCBs, HCr	PAHs, CPest			
C-30			PCBs			
D-10	PAHs	PCBs				
D-30						
E-10	PAHs	PAHs				
E-30						
F-10						
F-30	PCP					
G-10						
G-30						
H-10		PAHs		X	X	X
H-30						
R-10		PAHs				
R-50						X
Off-Site, Side-Gradient Monitoring Locations						
S-10						
S-50						
T-10						XC
T-50						
U-10						
U-50						
Off-Site, Downgradient Monitoring Locations						
MW-3S	PCP			XI	XI	X
MW-3D						
N-10				XI	X	X
N-50						
P-10				X	X	X
P-50						
Q-10				X	X	X
Q-50						
V-10			CPest	XI		XC
V-50						
P-1						NS
P-2				X		NS
P-3						NS
Off-Site, Downgradient Locations Meeting VOCs and Inorganic CALs before AWQC Modification				4	3	5
Off-Site, Downgradient Locations Meeting VOCs and Inorganic CALs after AWQC Modification				6	4	5
Off-Site Locations Meeting VOCs and Inorganic CALs for 3 Consecutive Years				4	NA	NA

Key:

Blank = No other organics detected or the location did not meet all of the CALs
CPest = Chlorinated pesticides
M = Met the VOCs and inorganics CALs after modifying the site-specific ambient water quality criteria
NA = Not applicable
NS = Not sampled
PAHs = Polynuclear aromatic hydrocarbons
PCBs = Polychlorinated biphenyls
PCP = Pentachlorophenol
X = Met the VOCs and inorganics CALs; from the 2001 Annual Ground Water Monitoring Report
XI = Met the VOCs and inorganics CALs except for iron; from the 2001 Annual Ground Water Monitoring Report
XC = Conditionally met the VOCs and inorganics CALs because of high detection limits; from the 2001 Annual Ground Water Monitoring Report

APPENDIX E

Evaluation of Costs and Constructability Issues for a
Containment/Barrier Wall at Midco I

APPENDIX E

EVALUATION OF COSTS AND CONSTRUCTABILITY ISSUES FOR A CONTAINMENT/BARRIER WALL AT MIDCO I

The costs and constructibility of a containment/barrier wall at Midco I were evaluated. The slurry wall, proposed as the source containment for the Midco I impacted areas, is to encompass the Exclusion Zone. A 1,700-foot long, 29- to 30-foot deep wall, located just outside the Exclusion Zone is estimated.

Initially, geologic cross sections of the proposed containment/barrier wall location were developed based upon previous soil boring information. The locations of the cross sections are shown in Figure E-1. The cross sections developed are presented as Figures E-2 and E-3. This information was distributed to potential slurry wall contractors for their recommendations.

A. Containment/Barrier Wall Construction

The two containment/barrier wall types evaluated included a soil bentonite slurry wall and a vibrating beam method Impermix® slurry wall. Both slurry wall types have been successfully used in applications such as Midco I and have been accepted by the EPA. Schematic cross sections of each of these slurry wall types are shown in Figure E-4. Both conventional (backhoe) construction methods and in-situ mixed slurry wall construction methods were evaluated.

Conventional soil-bentonite slurry wall construction would involve backhoe excavation of a trench around the Exclusion Zone, using bentonite slurry to maintain an open trench. The excavated soils are temporarily stockpiled near the trench and later used as part of the backfill. In addition to stabilizing the excavation, bentonite slurry forms a "filter cake" on the trench walls, which reduces the slurry wall's final permeability. As shown on Figure E-4, the trench would be keyed into the low permeability silty clay stratum beneath the Midco I site to assure minimal leakage under the final wall. This slurry wall construction method would include backfilling the trench with the excavated soil mixed with powdered bentonite and bentonite slurry. Walls of

this composition provide a low cost barrier with low permeability and good chemical resistance.

Bentonite slurry walls can also be constructed using trenching equipment that opens the trench and mixes the soil-bentonite backfill in the same step. In this method, bentonite slurry is added while the digging chain and cutters of the trencher blends the bentonite with the native soil, resulting in a soil-bentonite mixture in the "wall" without removing the soil. This construction method has been used successfully in other sites in northern Indiana.

The vibrating beam method is an alternate to open trenching for the construction of a slurry wall. This method incorporates the use of high pressure, low volume jetting with a vibrated beam to make a narrow trench in the soils. After the slurry beam attains the desired depth, the beam is extracted at a controlled rate to fill the void left by the beam extraction, creating an in-ground panel of slurry. This process is repeated along the line of the wall, with each beam insertion overlapping the previously inserted panel. A two-foot wide by two-foot deep trench is excavated at the surface as a slurry reservoir during the installation. The slurry panel can consist of any pumpable slurry. The main advantage of the vibrating beam method is the low quantity of soil spoils generated for disposal, however, at Midco I, the excavated soils likely can be placed on the surface of the Exclusion Zone, before capping.

B. Slurry Compatibility

The compatibility of conventional bentonite slurry and soil-bentonite backfills with the contaminants at Midco I was reviewed by the slurry wall contractors and a bentonite supplier. Based upon the results of the 2001 annual ground water monitoring, the slurry wall contractors expect that conventional bentonite slurry is compatible with the site chemicals. Neither the use of higher cost attapulgite slurry, treated bentonite slurry nor the use of an additional geomembrane was deemed necessary. The levels of inorganics in the ground water at Midco I are within the range of concentrations where no adverse affects have been noted in a study provided by a bentonite supplier (CETCO). However, since calcium and magnesium have been reported to affect sodium bentonite under

certain conditions, we may recommend a compatibility study prior to finalizing the slurry wall design. Compatibility testing would add less than $10,000 to the total cost.

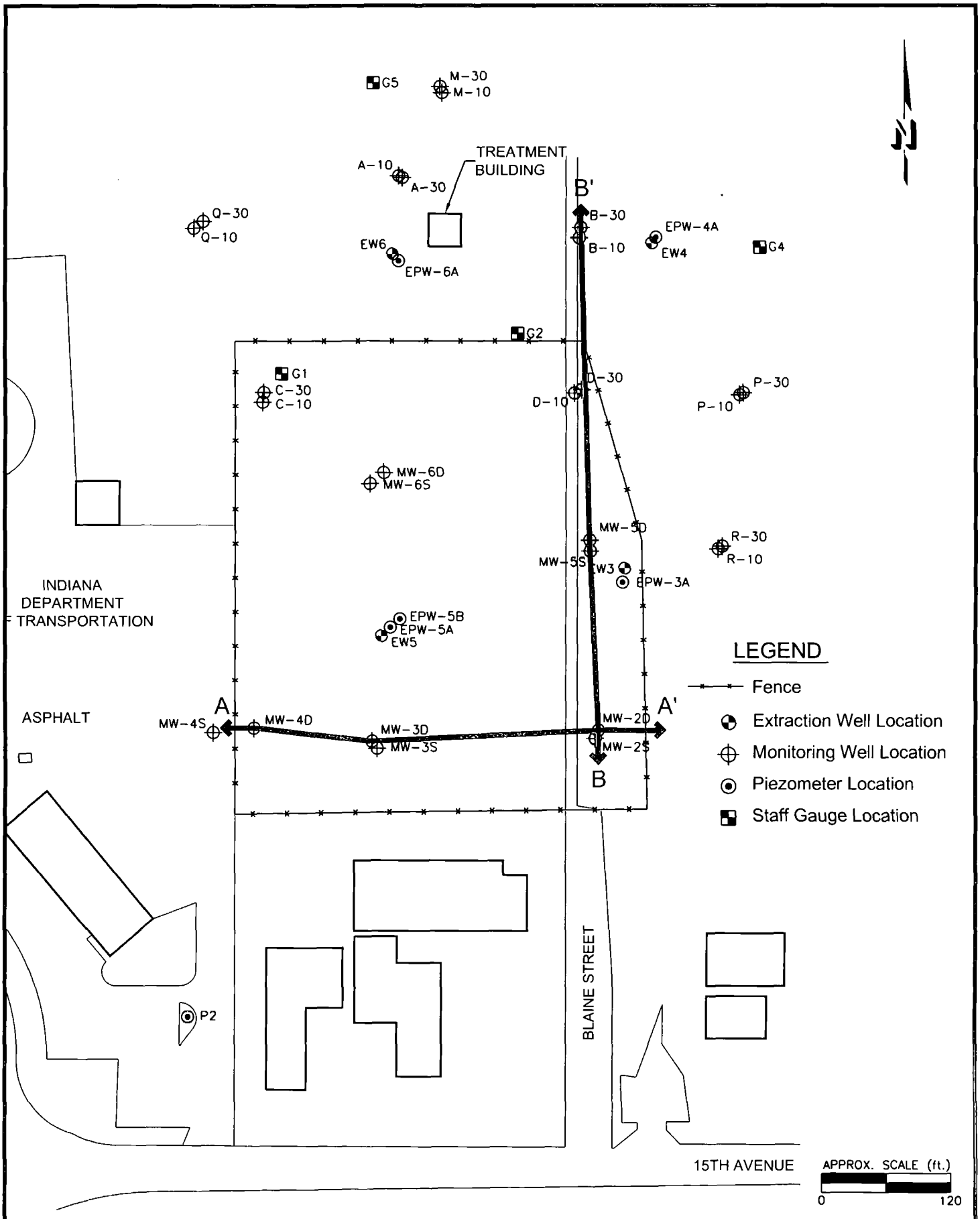
In combination with the use of the vibrating beam method slurry wall, the use of Impermix® slurry was recommended by one of the contractors. This high chemical resistance, self-hardening material was suggested as an alternative to the compatibility testing. Impermix® (supplied by Liquid Earth Support Inc.) is reported to attain low permeability (10^{-9} cm/sec) and was developed for chemical resistance. It is a mixture of attapulgite clay and a slag/Portland cement combination. Due to the narrow slurry panel constructed using this method, the cost of this specialized slurry is comparable to the cost of the chemical compatibility study.

C. Costs Comparison

The trial bids for containment/barrier wall construction at Midco I ranged from approximately $214,000 to $432,000 for the conventional (backhoe and trencher method) slurry wall contractors as presented in Table E-1. The bid for the vibrating beam method was $306,900. Additional fees of $180,000 for submittal of a work plan, design package, contractor selection, field oversight, surveying, fence replacement and final reporting are projected. The costs for handling any significant obstructions encountered in the subsoil would be additional also.

D. Midco I Containment/Barrier Wall Recommendations

Since the compatibility of bentonite slurry is not expected to be an issue at Midco I, the use of a conventional slurry wall or a vibrating beam method is feasible and continues to be a cost effective means toward closure. Based upon the trial bids received, we expect the proposed containment/barrier wall can be constructed in the range $300,000 to $500,000, which is comparable to our early estimate ($410,000).



CPFs\Midco Alternate Remedy\workplan appendices\appendix E slurry wall\Cross Sections Location Map

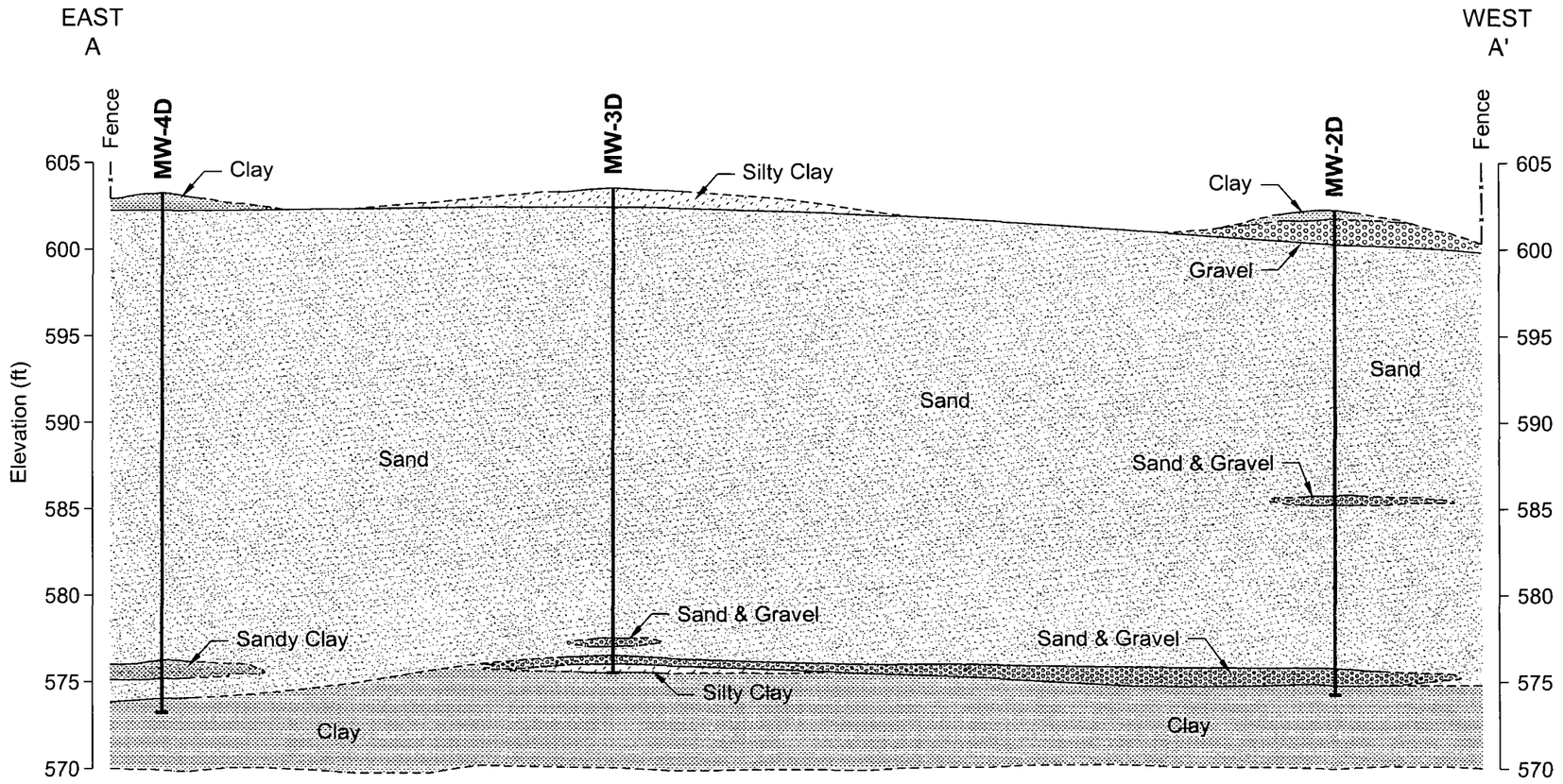
ENVIRON

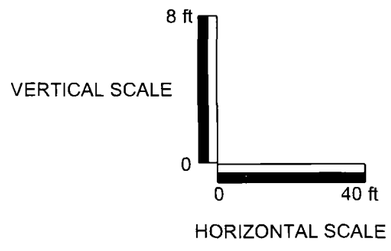
740 Waukegan Road, Suite 401, Deerfield, IL 60015

Cross Sections Location Map
Midco I Site
Gary, Indiana

Figure
E-1

Drafter:	APR	Date:	5/10/02	Contract Number:	21-8601W	Approved:	Revised:





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740 Waukegan Road, Suite 401, Deerfield, IL 60015

Geologic Cross Section A-A'
Midco I Site
Gary, Indiana

DATE	CONTRACT NUMBER		FIGURE
03/26/02	21-8601W		E-2
DRAFTER: APR	APPROVED: JMF	REVISED:	

CPFs\Midco Alternate Remedy\workplan appendices\appendix E slurry wall\Cross Section A-A'

SOUTH
B

NORTH
B'

MW-2D

MW-5D

B-30

Elevation (ft)

605
600
595
590
585
580
575
570

Clay

Gravel

Fill

Black Cinder

Sand & Gravel

Sand

Sand

Sand & Gravel

Sand & Gravel

Clay

Sandy Clay

Clay

Gravel

8 ft

VERTICAL SCALE

0

0

40 ft

HORIZONTAL SCALE

CPE:\Midco Alternate Remedy\workplan appendices\appendix E_slurry wall\Cross Section B-B'

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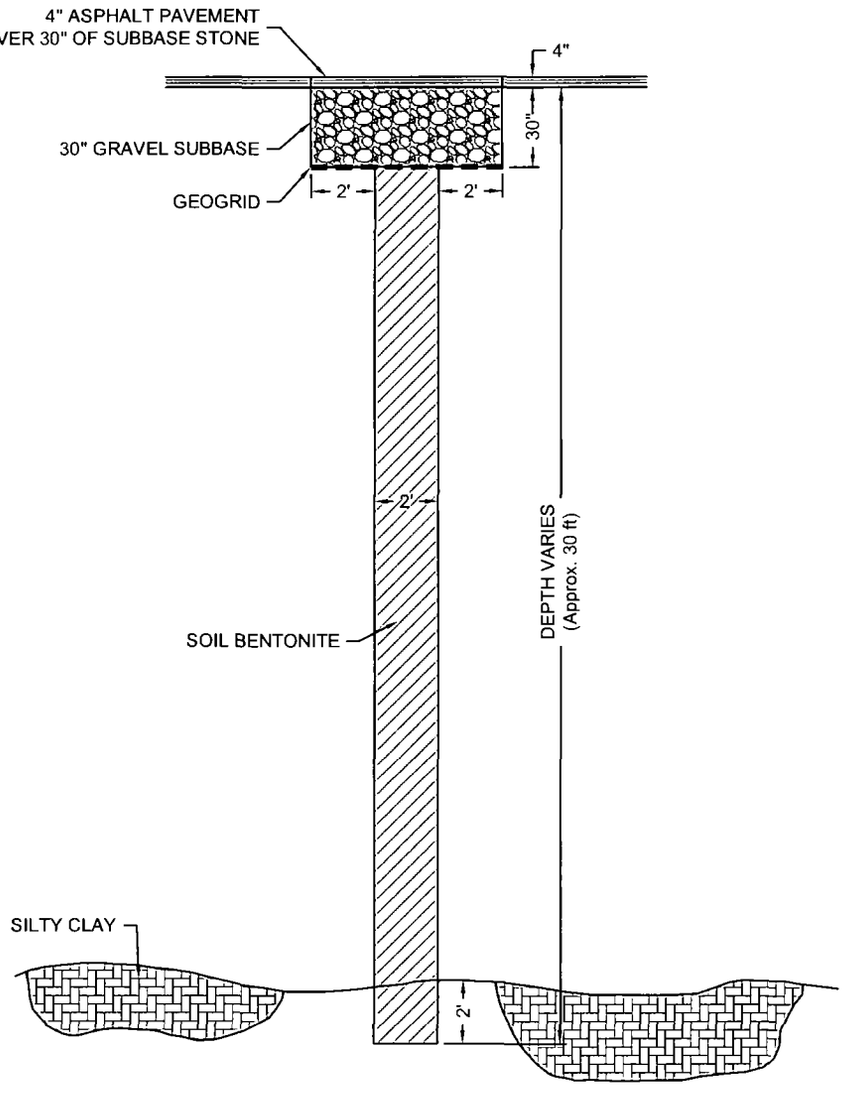
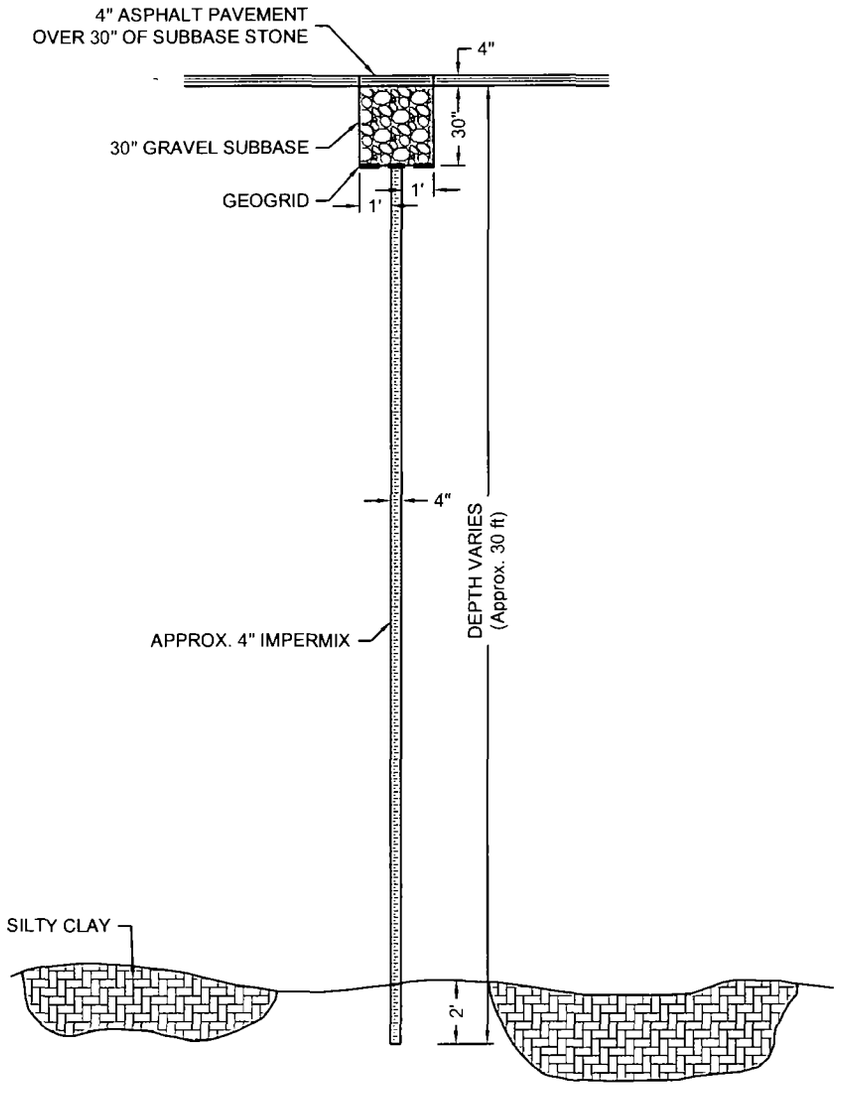
740 Waukegan Road, Suite 401, Deerfield, IL 60015

Geologic Cross Section B-B'
Midco I Site
Gary, Indiana

DATE:	CONTRACT NUMBER		FIGURE
03/26/02	21-8601W		E-3
DRAFTER: APR	APPROVED: JMF	REVISED:	



SOIL BENTONITE SLURRY WALL
TYPICAL CROSS SECTION



IMPERMIX VIBRATED BEAM SLURRY WALL
TYPICAL CROSS SECTION

APPROX. SCALE (ft.)
0 6

CPFs\Midco Alternate Remedy\workplan appendices\appendix E slurry wall\Cross Sections of Slurry Wall

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Typical Cross Sections of Slurry Wall (Two Methods)
Midco I Site
Gary, Indiana

Figure
E-4

Drafter:	APR	Date:	5/10/02	Contract Number:	21-8601W	Approved:	Revised:

APPENDIX F

Evaluation of Capping Alternatives for Both Sites

APPENDIX F

EVALUATION OF CAPPING ALTERNATIVES FOR BOTH SITES

As part of the proposed source containment, ENVIRON examined several capping options, including capital and maintenance costs, effectiveness of the containment and the limitations on possible future use. The capping alternatives were evaluated as part of our discussions for a cap other than the thick cap section provided in the SOW, which may be unworkable for the future uses of the sites. Four capping alternatives were explored, including concrete, clay, geosynthetic/clay and asphalt caps. Concrete capping was briefly considered, but was rejected due to it's brittle properties caused by temperature cycling and/or differential settling, in turn compromising the integrity of the cap, and it's higher capital costs. No further summary of this option is included in this report. The findings of the other three options are summarized below. The details of the cost comparison are presented in Table F-1.

A. Clay Cap

Clay caps consist of a multi-layer, low-permeability cover over the site to stabilize surface soil and reduce surface water infiltration. Performance standards for caps typically require minimum liquid migration through the cap (i.e. permeability in the order of $1x10^{-7}$ cm/sec or lower), low cover maintenance requirements, efficient site drainage, and high resistance to damage by settling or subsidence. The typical clay cap consists only of a vegetative and protective layer and a clay layer.

Advantages:

- Less expensive than other alternatives.
- Proven technology.
- Does not tend to degrade when in contact with organic contaminants.
- Clay caps have high resistance to damage by settling or subsidence.

Disadvantages:

- Susceptible to cracking if clay material is desiccated.
- Maintenance intensive. Integrity of the cover requires regular vegetation upkeep and seeding for erosion control.
- Cap is thicker than geosynthetic clay or asphalt caps.
- The site cannot be reused until after completion of the remedy.

Costs:

- Typical design and installation costs are in the order of $242,000 per acre. Routine maintenance costs are typically $1,000 per acre per year.

B. Geosynthetic/Clay Cap

A geosynthetic/clay composite cap is similar to a clay cap, but includes a drainage layer over the low permeability geosynthetic layer. These layers are typically installed between the vegetative and protective layer and the clay layer.

Advantages:

- Proven technology.
- Geomembrane is essentially impermeable, but if it develops leaks, soil component tends to prevent significant infiltration.
- Synthetic membranes can improve a surface cap's design resistance to burrowing animals, penetration by plant roots, and freeze-thaw cycles.
- Geosynthetic/Clay caps have high resistance to damage by settling or subsidence.
- Cap is not as thick as normal clay cap.

Disadvantages:

- Construction costs as high as low permeability asphalt covers.
- Geomembranes may be punctured during installation and use.
- Inspection of buried geosynthetic barrier is extremely difficult.
- Maintenance intensive. Integrity of the cover requires regular vegetation conservation and seeding for erosion control.
- Chemical compatibility between the membrane and contaminant may be an issue. Compatibility needs to be determined before installation.
- The site cannot be reused until after completion of the remedy.

Costs:

- Typical design and installation costs are in the order of $288,500 per acre. Routine maintenance costs are typically $1,000 per acre per year.

C. Low Permeability Asphalt Cap

Low Permeability Asphalt capping consists of a high-strength, low-permeability cover over the waste to stabilize surface soil and reduce infiltration of surface water. The bitumen binder in asphalt provides some flexibility, making the cover more resistant to cracks that tend to form as a result of temperature cycling and/or differential settling. The low-permeability asphalt layer typically is placed on a high-permeability foundation layer, which helps reduce the negative effects of differential settling and allows drainage. Drainage under the low-permeability layer is necessary to prevent accumulation of small amounts of water that may leak through the low-permeability layer or migrate upward from the soil. This water can freeze and expand during cold weather, causing frost heave damage to the asphalt cover.

The application methods used in the installation of an asphalt cap are similar to conventional road paving, but include modifications to reduce permeability and increase durability of the paving that forms the low-permeability element. However, asphalt-paving mixtures used for capping will require a more tightly controlled particle size

distribution and a higher bitumen content in comparison to a standard road paving mixture.

Advantages:

- Asphalt caps permit reuse of the site. Typical applications include parking lots, equipment storage yards and even multi-use sports facilities.
- When properly prepared and installed, low permeability asphalt caps require very low maintenance. The nature of the binder and the small size of the aggregate reduce air voids to a level where they do not interconnect. Proprietary formulations for low hydraulic conductivity asphalts develop stress at slower rates and fail at a considerably lower temperatures than conventional asphalts.
- Asphalt covers are easily inspected (and repaired, if necessary) since none of its components are buried.
- Asphalt caps resist erosion, remain stable on slopes and proprietary asphalt formulations conforms to differential settlement of underlying materials.
- Thinner cross-sections of asphalt caps are obtained when compared to standard clay and geosynthetic/clay caps of similar hydraulic conductivities.
- Asphalt caps are significantly faster to install than conventional covers, with an average installation rate of 1.5 acres per day on a prepared sub-base.

Disadvantages:

- Uncertainty regarding longevity studies. Long-term maintenance knowledge is not readily available due to its recent innovation.
- Asphalt caps have lower resistance to damage by settling or subsidence when compared to conventional caps.

Costs:

- Typical design and installation costs are in the order of $175,000 per acre. Routine maintenance (i.e., inspections) costs are typically $100 per acre per year.

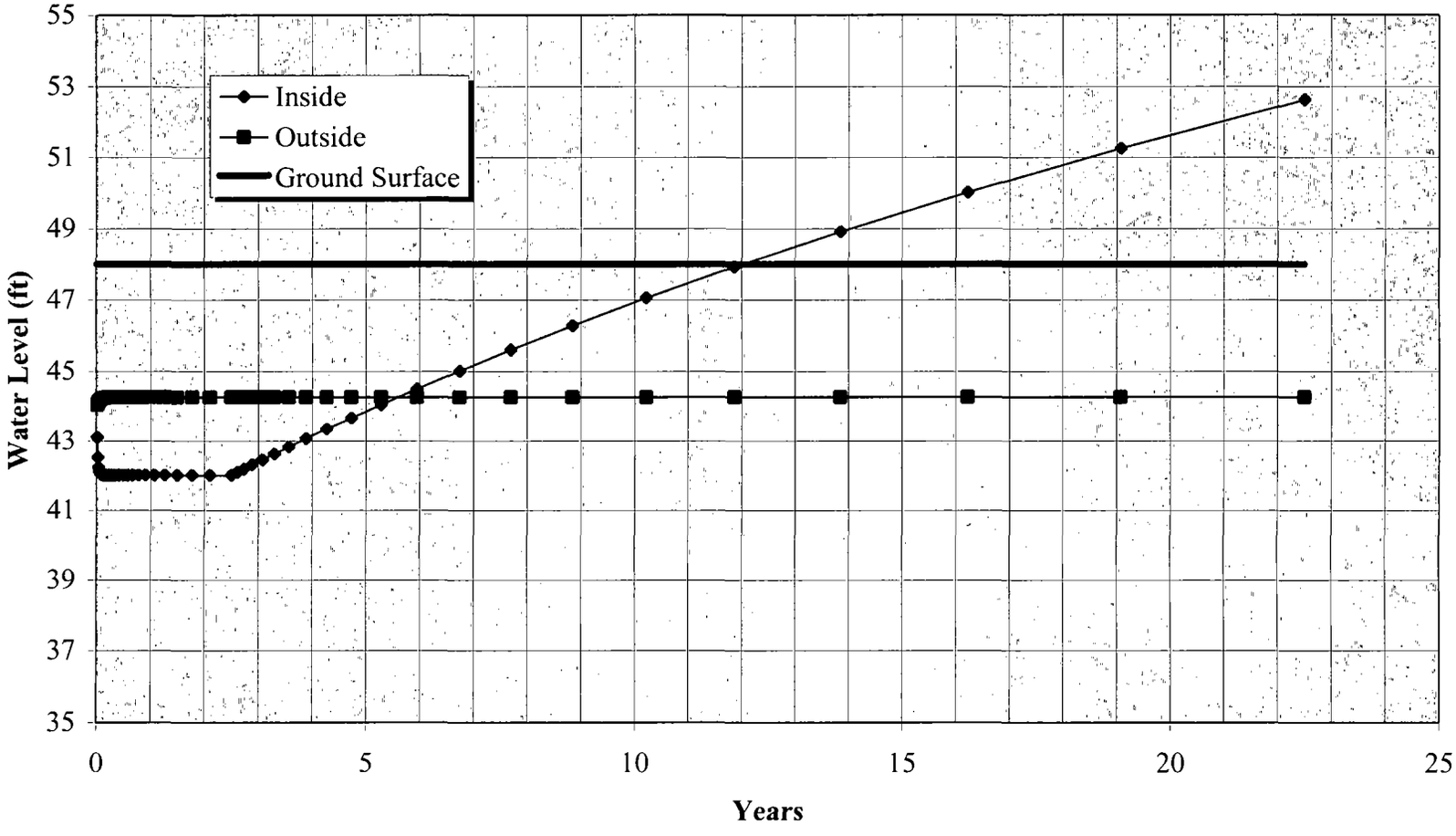
In addition to the review of the capping alternatives, ENVIRON also modeled the interior of the proposed Midco I containment system to determine if the water level would reach steady state or if some type of dewatering or gate system may be required to prevent the water level from rising near the surface. Based on the model results, dewatering or the use of gates will be necessary. According to the modeling results, once pumping of the ground water within the containment is terminated, the containment will require dewatering after an approximately 10- to 15-year period. If installation of gates or dewatering were not performed, the ground water table within the containment would eventually rise to the ground surface, undermining the cover. A description of the models used is included in this appendix.

D. Recommendations

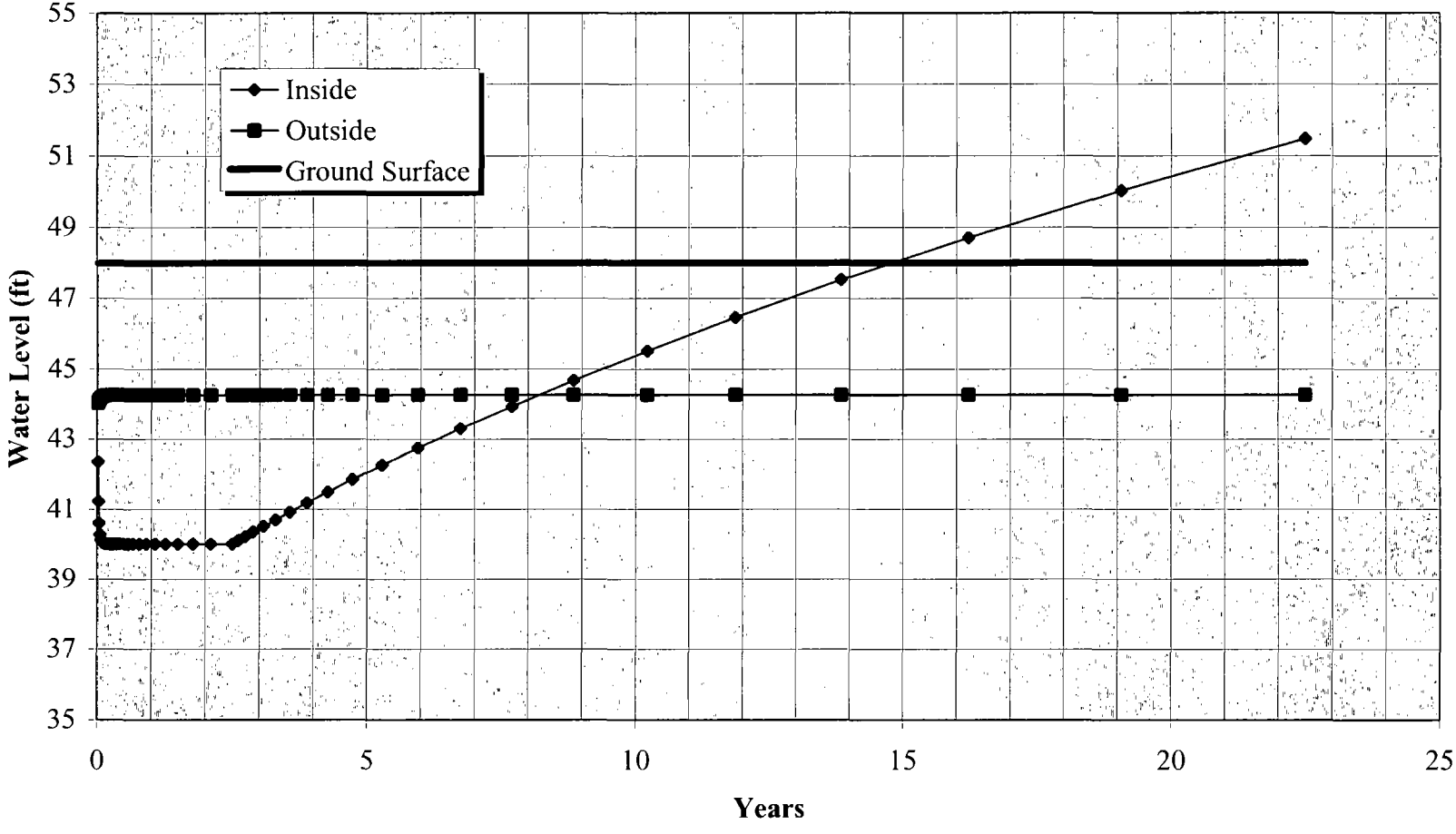
Four capping alternative were considered for the cover to be installed at the Midco Sites. Based on the review of the other three options and their respective advantages and disadvantages, and an estimate of the capital and operations and maintenance costs, we recommend the use of Low Permeability Asphalt as the cover of choice for the sites. However, the selection of the capping alternative at Midco II will need to consider plans for the expansion of the airport.

ENVIRON identified three viable options for addressing the potential long-term buildup of ground water in the proposed Midco I containment area. These options include: (1) dewatering on a periodic basis, (2), installation of funnel and gate system (i.e., passive treatment) and (3) installation of gravel gates only (i.e., non-treatment, allowing for natural attenuation). A final decision regarding the dewatering method to be used can be postponed until completion of the remedy and due to the length of the recharge period.

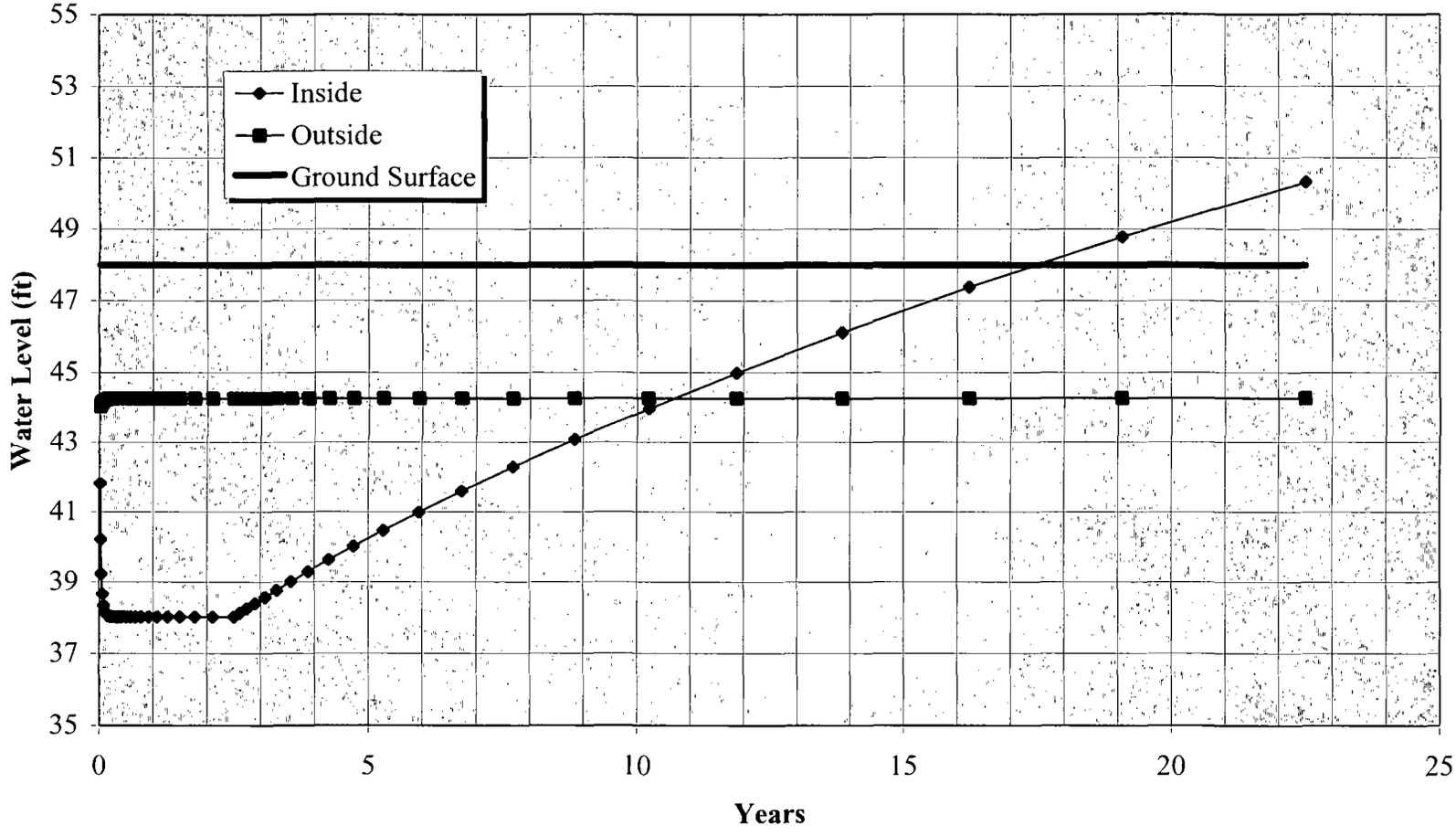
Slurry Wall/Asphalt Cap Containment Modeling
Ground Water Table Lowered by Two Feet
Midco I Site
Gary, Indiana



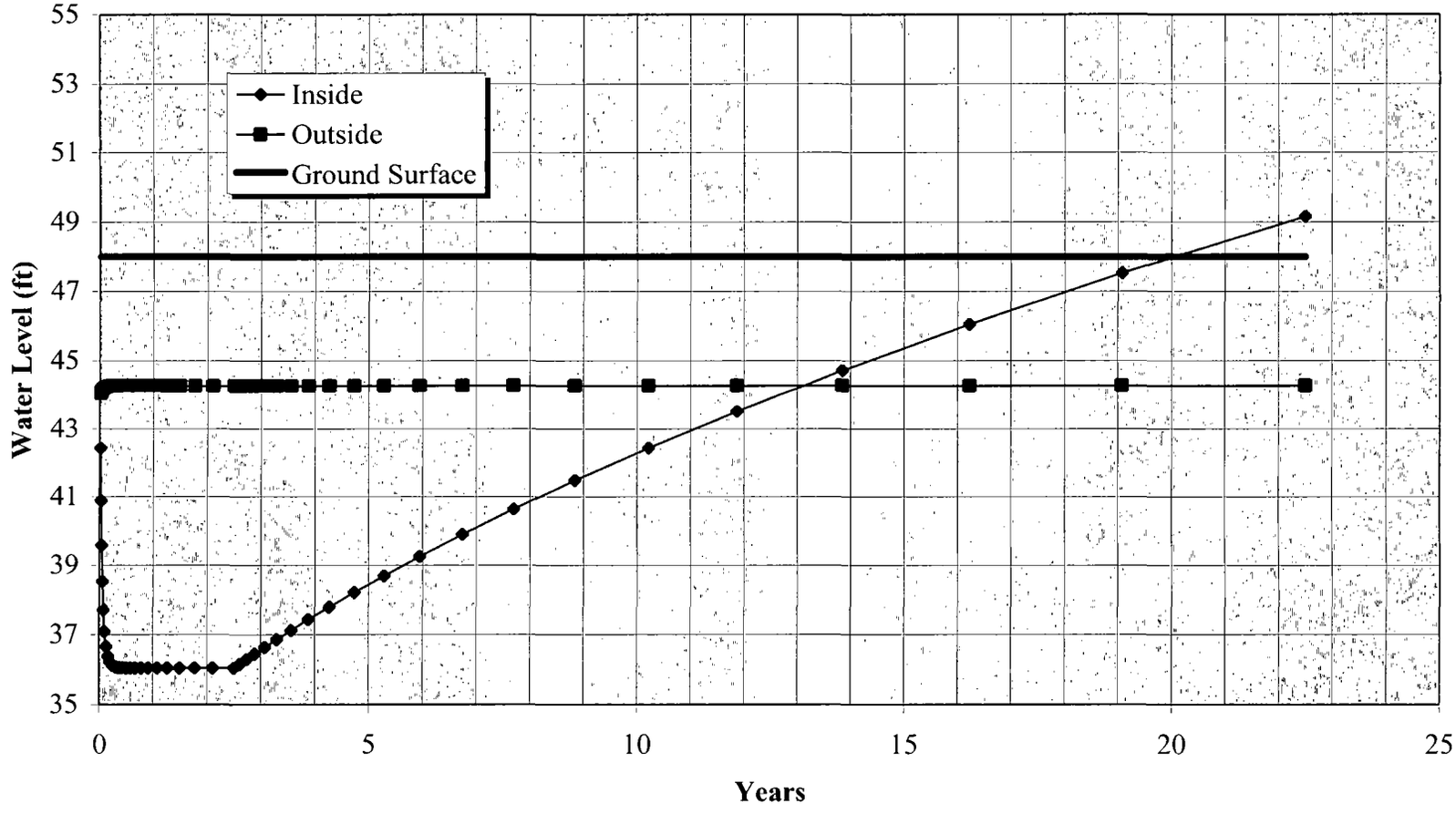
Slurry Wall/Asphalt Cap Containment Modeling
Ground Water Table Lowered by Four Feet
Midco I Site
Gary, Indiana



Slurry Wall/Asphalt Cap Containment Modeling
Ground Water Table Lowered by Six Feet
Midco I Site
Gary, Indiana



Slurry Wall/Asphalt Cap Containment Modeling
Ground Water Table Lowered by Eight Feet
Midco I Site
Gary, Indiana



Midco I Containment Modeling

21-8601 Env Compliance

Principal: Ron Hutchens Manager: S. Hayter Start date: October

Assumptions:

Hydraulic Conductivity	Sand:	Kx= 25	Ky=25	Kz=5	ft/day	
	Clay:	Kx=1e-7	Ky=1e-7	Kz=1e-7	cm/sec	2.8346E-04
	Slurry Wall:	Kx=1e-7	Ky=1e-7	Kz=1e-7	cm/sec	

Lower water level by	Required Pumpage			
	Recharge =15"/yr		Recharge =2.5"/yr	
	0.003425 ft/day		0.000570776 ft/day	
	ft^3/day	gpm	ft^3/day	gpm
2 ft	555	2.88	91	0.47
4 ft	556	2.89	101	0.52
6 ft	560	2.91	105	0.54
8 ft	565	2.93	110	0.57

Ground Water/Containment System Modeling

Several computer based environmental models were used to determine and or verify the design parameters for the source area containment and remediation system. The design parameters included the ground water pumping rates within the contained area, the permeability of the cap and slurry walls and the long term dewatering requirements.

ENVIRON carried out a series of HELP model runs to estimate percolation of precipitation through the site soils. The HELP model, Hydrological Evaluation of Landfill Performance Model, is a quasi-two-dimensional, deterministic water budget model (USEPA 1988). It was developed to help landfill designers estimate the amount of water percolating through various landfill covers. Based on the site soil types and average annual precipitation, the HELP model determines the amount of water that percolates to the water table. For Gary, Indiana, the USEPA assumes an average annual precipitation of 40.32 inches. The resulting annual percolation was calculated to be 13.22 inches. ENVIRON assumed a rounded number of 15 inches per year.

ENVIRON also used the HELP model to simulate percolation through an asphaltic cap (K=1 x 10-6 cm/sec). Assuming an average annual precipitation of 40.32 inches, the resulting annual percolation was calculated to be 2.12 inches. ENVIRON assumed a rounded number of 2.5 inches per year.

In addition, ENVIRON used the MODFLOW model to determine the dewatering requirements during the SVE activities. MODFLOW is a three-dimensional finite difference ground water flow model (McDonald and Harbaugh, 1988). MODFLOW was used to simulate the removal of water from the contained area by pumping wells located within the containment area. MODFLOW was also used to determine the rebound rate of the water table after the ground water pumping ceased within the contained area.

The MODFLOW calculations were conducted using the annual percolation rates for both the cap and non-cap scenarios and for dewatering depth of 2 feet, 4 feet, 6 feet and 8 feet below the static water table. The required pumping rates for the cap and non-cap scenarios, for each of the four dewatering depths, are contained in the attached table. The rate of the water table rebound was only calculated using the cap scenario. The water table rebound versus time for the four dewatering depths are presented the attached figures.

References

United States Environmental Protection Agency (USEPA). 1988. Background document on subsurface fate and transport model (EPACML). Prepared for the Office of Solid Waste-WH-333. Washington D.C. August.

Landfill Performance (HELP) Model, Users guide (EPA/600/R-94/168a) & Engineering Documentation (EPA/600/R-94/168b) Office of Research and Development, September, 1994

McDonald, M.G., and Harbaugh, A.W. 1988. A Modular 3-Dimensional Groundwater Flow Model: Technique of Water resource Investigation 06-A1, United States Geological survey, 576 p.